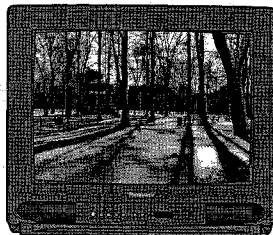
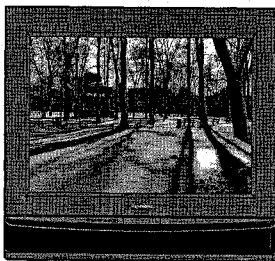


Service Manual

Color Television



CT-32S20U



All 35" Receivers

Main Manual (NA5D)

Panasonic

Models

Chassis

CT-32S20U	ANEDP276
CT-35G21UU	ALEDP278
CT-35G21CU	ALEDP278
CT-35G21U	ALEDP278
CT-35G31UU	AEDP278
CT-35G31U	AEDP278

NOTE: Model CT-35G21UU is identical to the CT-35G21U and CT-35G31UU is identical to the CT-35G31U except for the magnetic field used in the factory to adjust purity and convergence for different markets.

This Service Manual is issued as a service guide for the models of the NA5D family listed above. Included in this manual are a set of schematics, block diagrams, operations overview, functional descriptions, alignment procedures, disassembly procedures, and a complete parts list.

WARNING: This Service Manual is designed for experienced repair technicians only and is not designed for use by the general public. It does not contain warnings or cautions to advise non-technical individuals of potential dangers in attempting to service a product. **Products powered by electricity should be serviced or repaired only by experienced professional technicians.** Any attempt to service or repair the product or products dealt with in this Service Manual by anyone else could result in serious injury or death.

The service technician is required to read and follow the "Safety Precautions" and "Important Safety Notice" in this manual.

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Important Safety Notice

Special components are used in this television set which are important for safety. These parts are identified on the schematic diagram by the symbol  and printed in **BOLD TYPE** on the replacement parts list. It is essential that these critical parts are replaced with the manufacturer's specified replacement parts to prevent X-ray radiation, shock, fire or other hazards. Do not modify the original design without the manufacturer's permission.

Safety Precautions

General Guidelines

An **Isolation Transformer** should always be used during the servicing of a receiver whose chassis is not isolated from the AC power line. Use a transformer of adequate power rating as this protects the technician from accidents resulting in personal injury from electrical shocks. It will also protect the Receiver from being damaged by accidental shorting that may occur during servicing.

When servicing, observe the original lead dress, especially in the high voltage circuit. Replace all damaged parts (also parts that show signs of overheating.)

Always Replace Protective Devices, such as fishpaper, isolation resistors and capacitors, and shields after servicing the Receiver. Use only manufacturer's recommended rating for fuses, circuit breakers, etc.

High potentials are present when this Receiver is operating. Operation of the Receiver without the rear cover introduces danger from electrical shock. Servicing should not be performed by anyone who is not thoroughly familiar with the necessary precautions when servicing high-voltage equipment.

Extreme care should be practiced when **Handling the Picture Tube**. Rough handling may cause it to implode due to atmospheric pressure (14.7 lbs per sq. in.). Do not nick or scratch the glass or subject it to any undue pressure. When handling, use safety goggles and heavy gloves for protection. **Discharge the picture tube** by shorting the anode to chassis ground (not to the cabinet or to other mounting hardware). When discharging, connect cold ground (i.e. dag ground lead) to the anode with a well insulated wire or use a grounding probe.

Avoid prolonged exposure at close range to unshielded areas of the picture tube to prevent exposure to X-ray radiation.

The **Test Picture Tube** used for servicing the chassis at the bench should incorporate safety glass and magnetic shielding. The safety glass provides shielding for the tube viewing area against X-ray radiation as well as implosion. The magnetic shield limits X-ray radiation around the bell of the picture tube in addition to restricting magnetic effects. When using a picture tube test jig for service, ensure that the jig is capable of handling 31kV without causing X-ray radiation.

Before returning a serviced receiver to the owner, the service technician must thoroughly test the unit to ensure that it is completely safe to operate. **Do not use a line isolation transformer when testing.**

Leakage Current Cold Check

Unplug the AC cord and connect a jumper between the two plug prongs.

Measure the resistance between the jumpered AC plug and exposed metallic parts such as screwheads,

antenna terminals, control shafts, etc. If the exposed metallic part has a return path to the chassis, the reading should be between 240k Ω and 5.2M Ω . If the exposed metallic part does not have a return path to the chassis, the reading should be infinite.

Leakage Current Hot Check (See Figure 1)

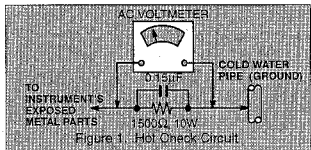
Plug the AC cord directly into the AC outlet. Do not use an isolation transformer during the check.

Connect a 1.5k Ω 10 watt resistor in parallel with a 0.15 μ F capacitor between an exposed metallic part and ground. Use earth ground, for example a water pipe.

Using a DVM with a 1000 ohms/volt sensitivity or higher, measure the AC potential across the resistor.

Repeat the procedure and measure the voltage present with all other exposed metallic parts.

Verify that any potential does not exceed 0.75 volt RMS. A leakage current tester (such as a Simpson Model 229, Sencore Model PR57 or equivalent) may be used in the above procedure, in which case any current measure must not exceed 1/2 milliamp. If any measurement is out of the specified limits, there is a possibility of a shock hazard and the Receiver must be repaired and rechecked before it is returned to the customer.



X-ray Radiation

WARNING: The potential source of X-ray radiation in TV sets is in the High Voltage section and the picture tube.

Note: It is important to use an accurate, calibrated high voltage meter.

Set the **brightness, picture, sharpness and color** controls to Minimum.

Measure the High Voltage. The high voltage should be 29.25kV $\pm$ 1.25kV for 32" Receivers and 31.5kV $\pm$ 1.25kV for 35" Receivers. If the upper limit is out of tolerance, immediate service and correction is required to insure safe operation and to prevent the possibility of premature component failure.

Horizontal Oscillator Disable Circuit Test

This test must be performed as a final check before the Receiver is returned to the customer. See **Horizontal Oscillator Disable Circuit Procedure Check** in this manual.

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Service Notes

NOTE: These components are affixed with glue. Be careful not to break or damage any foil under the component or at the pins of the ICs when removing. Usually applying heat to the component for a short time while twisting with tweezers will break the component loose.

Leadless Chip Components (surface mount)

Chip components must be replaced with identical chips due to critical foil track spacing. There are no holes in the board to mount standard transistors or diodes. Some chip capacitor or resistor board solder pads may have holes through the board, however the hole diameter limits standard resistor replacement to 1/8 watt. Standard capacitors may also be limited for the same reason. It is recommended that identical components be used.

Chip resistors have a three digit numerical resistance code – 1st and 2nd significant digits and a multiplier. Example: 162 = 1600 or 1.6k Ω resistor, 0 = 0 Ω (jumper).

Chip capacitors generally do not have the value indicated on the capacitor. The color of the component indicates the general range of the capacitance.

Chip transistors are identified by a two letter code. The first letter indicates the type and the second letter, the grade of transistor.

Chip diodes have a two letter identification code as per the code chart and are a dual diode pack with either common anode or common cathode. Check the parts list for correct diode number.

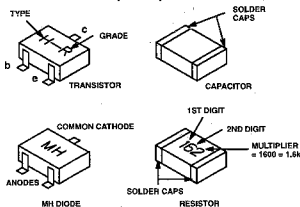
Component Removal

1. Use solder wick to remove solder from component end caps or terminals.
2. Without pulling up, carefully twist the component with tweezers to break the adhesive.
3. Do not reuse removed leadless or chip components since they are subject to stress fracture during removal.

Chip Component Installation

1. Put a small amount of solder on the board soldering pads.
2. Hold the chip component against the soldering pads with tweezers or with a miniature alligator clip and apply heat to the pad area with a 30 watt iron until solder flows. Do not apply heat for more than 3 seconds.

Chip Components



How to Replace Flat-IC

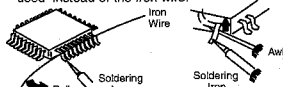
— Required Tools —

- Soldering iron
- De-solder braids
- Iron wire or small awl
- Magnifier

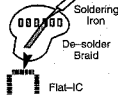
1. Remove the solder from all of the pins of a Flat-IC by using a de-solder braid.



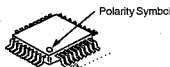
2. Put the iron wire under the pins of the Flat-IC and pull it in the direction indicated while heating the pins using a soldering iron. A small awl can be used instead of the iron wire.



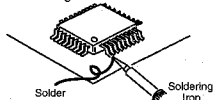
3. Remove the solder from all of the pads of the Flat-IC by using a de-solder braid.



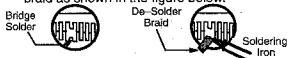
4. Position the new Flat-IC in place (apply the pins of the Flat-IC to the soldering pads where the pins need to be soldered). Properly determine the positions of the soldering pads and pins by correctly aligning the polarity symbol.



5. Solder all pins to the soldering pads using a fine tipped soldering iron.



6. Check with a magnifier for solder bridge between the pins or for dry joint between pins and soldering pads. To remove a solder bridge, use a de-solder braid as shown in the figure below.



Service Notes (Continued)

IMPORTANT: To protect against possible damage to the solid state devices due to arcing or static discharge, make certain that all ground wires and CRT DAG wire are securely connected.

CAUTION: The power supply circuit is above earth ground and the chassis cannot be polarized. Use an isolation transformer when servicing the Receiver to avoid damage to the test equipment or to the chassis. Connect the test equipment to the proper ground (∇) or (H) when servicing, or incorrect voltages will be measured.

WARNING: This Receiver has been designed to meet or exceed applicable safety and X-ray radiation protection as specified by government agencies and independent testing laboratories.

To maintain original product safety design standards relative to X-ray radiation and shock and fire hazard, parts indicated with the symbol $\triangle$ on the schematic must be replaced with identical parts. Order parts from the manufacturer's parts center using the part numbers shown in this service manual, or provide the chassis number and the part reference number.

For optimum performance and reliability, all other parts should be replaced with components of identical specifications.

Horizontal Oscillator Disable Circuit

This chassis employs a special circuit to protect against excessive high voltage and beam current. If, for any reason, the high voltage and beam current exceed a predetermined level this protective circuit activates and detunes the horizontal oscillator that limits the high voltage.

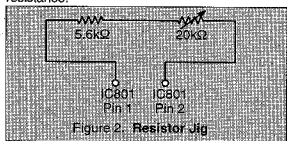
The over-voltage protection circuit is not adjustable. However, if components indicated by the symbol $\triangle$ on the schematic in either the horizontal sweep system or the over-voltage protection circuit itself are changed, the operation of the circuit should be checked using the following procedure.

Equipment needed to check the disable circuit:

1. Voltmeter (0 – 200V scale)
2. High Voltage Meter (0 – 50kV)
3. Variac or Isolation Transformer

Procedure:

1. Tune in a station to verify that the horizontal is in sync.
2. Obtain a Monoscope pattern or a signal generator crosshatch pattern.
3. Connect the voltmeter (–) lead to TPD2 and the (+) lead to TPD1 (junction of D555 anode, R556 & R557). Set **Bright** level to (0) and **Picture** for a 0.9 volt reading on the voltmeter.
4. Turn the Receiver OFF. Connect the resistor jig as shown in Figure 2, between IC801 pin1 and pin 2. The variable resistor should be set to **maximum** resistance.



5. Turn the Receiver On. Slowly reduce the variable resistor resistance until the horizontal sync frequency abruptly increases. Connect the high voltage meter to the CRT 2nd anode (H.V. button). **Note:** Use Dag Ground (C11 or C17 for 32" Receivers and C10 for 32" Receivers on the CRT Board) to connect the (–) lead of the meter.
6. Verify that that high voltage measured is below 37.8kV for a 32" Receiver, and below 39.5kV for a 35" Receiver, at the point where the frequency starts to change. If the high voltage is not within the specified limit, the cause must be determined and corrected before the Receiver is returned to the customer.

Receiver Feature Table

FEATURE / MODEL	CT-32S20U	CT-35G21CUU/JU	CT-35G31UJU
Chassis	NA5D	NA5D	NA5D
# of channels / Phase	1B1 / PH22	1B1 / PH22	1B1 / PH22D
Menu language	ENG / SP / FR	ENG / SP / FR	ENGLISH / FRENCH
Closed Caption	X	X	X
# of PIP tuners	1T	1T	2T
75 Ω input	X	X	X
Remote Model #	TNQ2AE002	TNQ2AE007	TNQ2AE006
Picture tube	M80JUA061X	A89LFL50X	A89LFL50X
Black face regular tube	X	X	X
Comb filter	Glass	Glass	Glass
Notch filter	X	X	X
V/A norm (X-both)	X	X	X
MTS/SAP/DEX	X	X	X
Built-in audio power	3.5W X 2 (10%)	3.5W X 2 (10%)	3.5W X 2 (10%)
# of speakers	2	2	2
Bass / Balance / Treble control	X	X	X
Air sound (simple)	X	X	X
Surround sound	N/A	N/A	X
A/V in (rear/front)	2/0	2/0	2/0
Fixed audio out	X	X	X
Variable audio out	X	X	X
S-VHS input (rear/front)	1/0	1/0	1/0
Dimensions (WxHxD) mm in	861 x 676 x 532 33.9 x 26.6 x 21.0	889.4 x 793 x 620.2 35.0 x 31.2 x 24.4	889.4 x 793.2 x 620.2 35.0 x 31.2 x 24.4
Weight (lb / kg)	52 / 114.5	78 / 172	78 / 172
Power source (V / Hz)	120 / 60	120 / 60	120 / 60
Power consumption, Max (A)	2.2	2.2	2.3
Anode voltage	29.25kV $\pm$ 1.25kV	31.5kV $\pm$ 1.25kV	31.5kV $\pm$ 1.25kV
Video input jack	1V _{p-p} 75 Ω phono jack	1V _{p-p} 75 Ω phono jack	1V _{p-p} 75 Ω phono jack
Audio input jack	500mV RMS, 47k Ω	500mV RMS, 47k Ω	500mV RMS, 47k Ω
To audio out jack	0-2.0V RMS, 4.7k Ω	0-2.0V RMS, 4.7k Ω	0-2.0V RMS, 4.7k Ω
A* Board TNP0042	AH	AL	AK
C* Board TNPA0203	AA	N/A	N/A
C* Board TNPA0355	N/A	AB	AB
L* Board TNP11T504	N/A	CZ	CZ
X* Board TNPA0205	AB	AB	AA
R* Board TNP11T805	Original	N/A	N/A
E* Board TNPA0190	N/A	N/A	AB
Y* Board TNP11T804	DZ	DZ	DZ
Z* Board DNP19080	AZ	DZ	DZ

Table 1. Receiver Features

Location of Controls for the Remote Unit

Basic Remote Control Functions For Television Operation

The following is an overview of the Remote Control unit for television operation. **Ensure the TV mode is selected by initially pressing the TV Mode Button.** Please refer to the indicated pages for additional information.

Multi Button

Programmable to operate up to six Remote Function buttons simultaneously.

Power Button

Press to turn the TV ON or OFF.

Mode Selection Buttons

Select the operation mode for the remote control.

Volume Buttons

Press to adjust TV sound level. Use with Channel buttons to navigate in menus.

Action Button

Press to display Main Menu and access or exit On Screen feature and Adjustment Menus.

R-Tune (Rapid Tune) Button

Press to switch to the previous channel.

PIP Move Button

Press to position PIP frame to any corner of the Main Picture (when PIP frame is displayed).

PIP Freeze Button

Press to stop action in the Main Picture or PIP frame (when the PIP frame is displayed).

PIP Size Button

Press to select size of PIP frame (when the PIP frame is displayed).

Keyboard "0 through 9" Buttons

Press desired channel number to randomly access any channel.

TV/Video Button

Press to select TV or one of two (2) Video inputs, for the Main Picture or the PIP frame (when the PIP frame is displayed).

Mute Button

Press to mute sound. A second press resumes sound.

Channel Buttons

Press to select channels. Use with Volume buttons to navigate in menus.

Recall Button

Press to display Time, status of Sleep Timer, Channel, Video Mode, Channel Caption (Station Identifier) and Audio Mode.

PIP (Picture In Picture) Button

Press to display the PIP frame, press again to remove PIP frame.

PIP Swap Button

Press to interchange PIP frame with Main Picture (when the PIP frame is displayed).

SEARCH Button

Press to automatically scan channels within the PIP frame.

VCR Function Buttons

Programmable to operate many brands of VCR's.

VCR/DSS (PIP) Channel Buttons

Select VCR or DSS Up/Down channels, or to move Up/Down channel selection within a PIP frame.

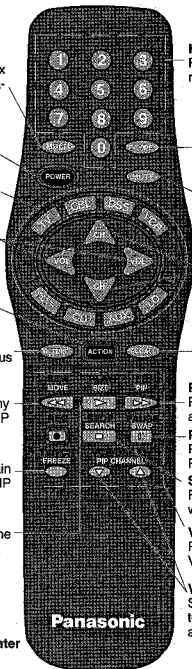


Figure 3. TNQ2AE006 – Home Theater Remote Control

Helpful Hints:

If the selected component does not respond to the remote control, ensure that the proper mode is selected. **First, press the Mode Selection Button** that corresponds to that component. For example, after first pressing the TV Mode Button, the remote will remain in the TV mode for the following commands. If a different mode button is pressed while operating the television, the TV mode button must be pressed again to enable the TV mode control.

Note:

For additional information on the Remote Control, please refer to the Remote Control Quick Reference Functional Key Chart. (pages 10 and 11)

Location of Controls for the Remote Unit

Basic Remote Control Functions For Television Operation

The following is an overview of the Remote Control unit for television operation. **Ensure the TV mode is selected by initially pressing the TV button.** Please refer to the indicated pages for additional information.

Multi Button

Programmable to operate up to six Remote Function buttons simultaneously.

Power Button

Press to turn the TV ON or OFF.

Mode Selection Buttons

Select the operation mode for the remote control.

Volume Buttons

Press to adjust TV sound level. Use with Channel buttons to navigate in menus.

Action Button

Press to display Main Menu and access or exit On Screen feature and Adjustment Menus.

R-Tune (Rapid Tune) Button

Press to switch to the previous channel.

PIP Move Button

Press to position PIP frame to any corner of the Main Picture (when PIP frame is displayed).

PIP Freeze Button

Press to stop action in the Main Picture or PIP frame (when the PIP frame is displayed).

PIP Size Button

Press to select size of PIP frame (when the PIP frame is displayed).

To prolong the life of the batteries, the illumination of the keys can be toggled ON and OFF by pressing the R-TUNE and the RECALL buttons simultaneously.

Keyboard "0 through 9" Buttons

Press desired channel number to randomly access any channel.

TV/Video Button

Press to select TV or one of two (2) Video Inputs, for the Main Picture or the PIP frame (when the PIP frame is displayed).

Mute Button

Press to mute sound. A second press resumes sound.

Channel Buttons

Press to select channels. Use with Volume buttons to navigate in menus.

Recall Button

Press to display Time, status of Sleep Timer, Channel, Video Mode, Channel Caption (Station Identifier) and Audio Mode.

PIP (Picture In Picture) Button

Press to display the PIP frame, press again to remove PIP frame.

PIP Swap Button

Press to interchange PIP frame with Main Picture (when the PIP frame is displayed).

VCR Function Buttons

Programmable to operate many brands of VCR's.

VCR/DSS Channel Buttons

Select VCR or DSS Up/Down channels.

ONE TUNER, ILLUMINATED REMOTE, NO PIP SEARCH, NO UP OR DOWN CHANNEL SCAN.

Figure 4. TNQ2AE002 - Home Theater Remote Control - Illuminated

Helpful Hints:

If the selected component does not respond to the remote control, ensure that the proper mode is selected. **First, press the Mode Selection Button** that corresponds to that component. For example, after first pressing the TV Mode Button, the remote will remain in the TV mode for the following commands. If a different mode button is pressed while operating the television, the TV mode button must be pressed again to enable the TV mode control.

Note:

For additional information on the Remote Control, please refer to the Remote Control Quick Reference Functional Key Chart (pages 10 and 11).

Location of Controls for the Remote Unit

Basic Remote Control Functions For Television Operation

The following is an overview of the Remote Control unit for television operation. **Ensure the TV mode is selected by initially pressing** . Please refer to the indicated pages for additional information.

Multi Button

Programmable to operate up to six Remote Function buttons simultaneously.

Power Button

Press to turn the TV ON or OFF.

Mode Selection Buttons

Select the operation mode for the remote control.

Volume Buttons

Press to adjust TV sound level. Use with Channel buttons to navigate in menus.

Action Button

Press to display Main Menu and access or exit On Screen feature and Adjustment Menus.

R-Tune (Rapid Tune) Button

Press to switch to the previous channel.

PIP Move Button

Press to position PIP frame to any corner of the Main Picture (when PIP frame is displayed).

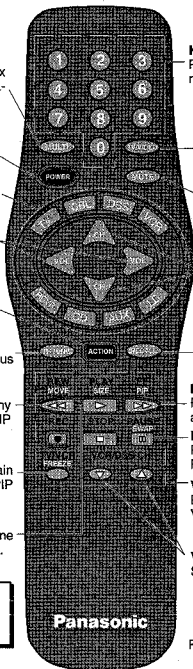
PIP Freeze Button

Press to stop action in the Main Picture or PIP frame (when the PIP frame is displayed).

PIP Size Button

Press to select size of PIP frame (when the PIP frame is displayed).

ONE TUNER, NON-ILLUMINATED REMOTE, NO PIP SEARCH, NO UP OR DOWN CHANNEL SCAN.



Keyboard "0 through 9" Buttons

Press desired channel number to randomly access any channel.

TV/Video Button

Press to select TV or one of two (2) Video inputs, for the Main Picture or the PIP frame (when the PIP frame is displayed).

Mute Button

Press to mute sound. A second press resumes sound.

Channel Buttons

Press to select channels. Use with Volume buttons to navigate in menus.

Recall Button

Press to display Time, status of Sleep Timer, Channel, Video Mode, Channel Caption (Station Identifier) and Audio Mode.

PIP (Picture In Picture) Button

Press to display the PIP frame, press again to remove PIP frame.

PIP Swap Button

Press to interchange PIP frame with Main Picture (when the PIP frame is displayed).

VCR Function Buttons

Programmable to operate many brands of VCR's.

VCR/DSS Channel Buttons

Select VCR or DSS Up/Down channels.

OPERATION

Figure 5. TNQ2AE007- Home Theater Remote Control

Helpful Hints:

If the selected component does not respond to the remote control, ensure that the proper mode is selected. **First, press the Mode Selection Button** that corresponds to that component. For example, after first pressing the TV Mode Button, the remote will remain in the TV mode for the following commands. If a different mode button is pressed while operating the television, the TV mode button must be pressed again to enable the TV mode control.

Note:

For additional information on the Remote Control, please refer to the Remote Control Quick Reference Functional Key Chart. (pages 10 and 11)

Remote Control Quick Reference Functional Key Chart

(Not all keys/functions are available on all Remotes)

KEY	MODE	FUNCTION
	TV VCR CABLE/DSS	Selects Channel Selects Channel Selects Channel
	RECEIVER/AMPLIFIER	Selects TV Video 1 Selects TV Video 2 Selects TV Video 3 Selects Tuner Selects CD Player Selects Tape Cassette Player VCR 1 VCR 2 VCR 3
	CD PLAYER	Selects Track Number
	LD PLAYER	Selects Track Number
	ALL COMPONENTS	Programmable Button That Can Operate Up To Six Remote Functions at once
	TV	Selects the TV Input Mode
	ALL COMPONENTS	Turns On and Off Selected Components
	TV, DSS, VCR, LDP CABLE RECEIVER/AMPLIFIER	Mutes TV Audio Mutes Audio Mutes Audio
	TV	TV Mode Selection for Remote Control
	CABLE	Cable Mode Selection for Remote Control
	DSS (DIGITAL SATELLITE SYSTEM)	DSS Mode Selection for Remote Control
	VCR	VCR Mode Selection for Remote Control
	RECEIVER/AMPLIFIER	Receiver/Amplifier Mode Selection for Remote Control
	COMPACT DISC	CD Mode Selection for Remote Control
	CASSETTE PLAYER, DVD	AUX Mode Selection for Remote Control Enables User to Operate a Tape Cassette Player, or Digital Video Disc
	LASER DISC PLAYER	LD Mode Selection for Remote Control
 	TV CABLE DSS LDP CD RECEIVER/AMPLIFIER DVD	Channel Up/Down, Menu Navigation Channel Up/Down DSS Guides and Menus Navigation Skip FF, REW Preset or Tuning Frequency Skip FWD / Skip REW
 	TV CABLE DSS RECEIVER/AMPLIFIER VCR LDP	Volume Up/Down, Menu Navigation Volume Up/Down DSS Guides and Menus Navigation Volume Up/Down TV Volume Up/Down TV Volume Up/Down

Figure 6. Remote Control Quick Reference Functional Key Chart

Remote Control Quick Reference Functional Key Chart

(Not all keys/functions are available on all Remotes)

KEY	MODE	FUNCTION
	LDP TV CABLE VCR DSS RECEIVER/AMPLIFIER CD TAPE CASSETTE PLAYER	Side A/B Selects Previously Tuned Channel Selects Previously Tuned Channel Selects Previously Tuned Channel Selects Previously Tuned Channel Switches between AM and FM Selects Next Disc Selects Tape Cassette Player A or B
	TV DSS	Activates TV Menus Acts as Menu Button for DSS
	TV DSS VCR LDP	Displays Channel, Time, and Audio Mode Displays Current DSS Settings Displays Current VCR Settings Displays Current LDP Settings
	TV DSS VCR LDP TAPE CD DVD	PIP Move DSS Guide Rewind Rewind Rewind Selects Previous Track Rewind
	TV DSS VCR LDP TAPE CD DVD	PIP Size Enter/Select Play Play Play (In Normal Direction) Play Play
	TV DSS VCR LDP TAPE CD DVD	PIP On/Off Exit/Clear Fast Forward Fast Forward Fast Forward Selects Next Track Fast Forward
	DSS VCR TAPE CABLE	One Touch Record in DSS Mode Record Record VCR Record
	TV DVD VCR LDP TAPE CD CABLE	PIP Search Stop Stop Stop Stop Stop VCR Stop
	DVD TV VCR LDP TAPE CD CABLE	Pause PIP Swap Pause Pause Pause Pause VCR Pause
	TV VCR DSS CABLE	PIP Freeze Selects TV/VCR Mode Selects TV/DSS Mode Selects TV/VCR Mode
 	TV VCR DSS CABLE	PIP Channel Up/Down (2 Tuner PIP Models Only) Channel Up/Down Channel Up/Down VCR Up/Down

Figure 7. Remote Control Quick Reference
Functional Key Chart – Continued

Location of Controls (Receiver)

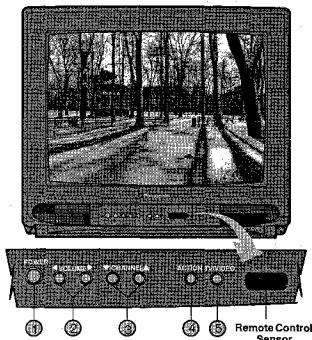


Figure 8. Front Control Panel (CT-32S20U)

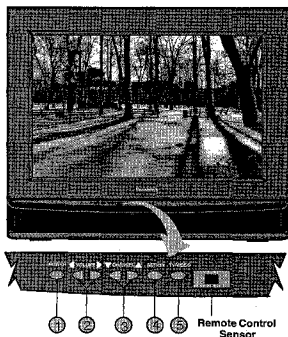


Figure 9. Front Control Panel (all 35" models)

Quick Reference Control Operation

Quick Reference Control Operation

- 1 **Power Button** – Press to turn ON or OFF.
- 2 **Volume Buttons** – Press to adjust Sound Level, or to adjust Audio Menus, Video Menus, and select operating features when menus are displayed.
- 3 **Channel Buttons** – Press to select programmed channels. Press to highlight desired features when menus are displayed. Also used to select Cable Converter box channels after programming Remote Control Infra-red codes (the TV/AUX/CABLE switch must be set in CABLE position).
- 4 **Action Button** – Press to display Main Menu and access On Screen feature and Adjustment Menus.
- 5 **TV/Video Button** – Press to select TV or one of two Video Inputs, for the Main Picture or the PIP frame (when PIP frame is displayed).

Main Menu Icons Selection

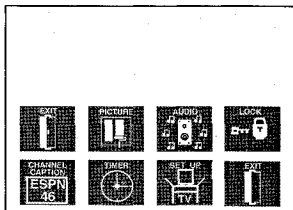


Figure 10. Main Menu Icons



Figure 11. Displays and Exits Menus

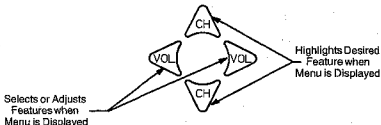


Figure 12. Controls for Menu Icon Selection
(located on Remote Control)

1. Press the ACTION button to display the Main Menu.
2. Press the CH ▲ or ▼ button and the VOL ◀ or ▶ button to move from one icon to another. The selected icon will be indicated in Red. Press the VOL buttons to move horizontally and the CH buttons to move vertically.
3. Press the ACTION button after selecting the desired icon.
4. Select the EXIT icon, then press the ACTION button to exit.

Bilingual and Trilingual Menu Selection

The Language Menu is factory set to **ENGLISH**. Follow these instructions to change the Language Menu to **Spanish, French and back to English** (CT-35G31U/JU is bilingual – ENGLISH or FRENCH only. Ignore references to Spanish (Español) in this section).

1. Press the ACTION button to display the Main Menu.
2. Press the CH ▲ or ▼ button and VOL ◀ or ▶ button to highlight the SET-UP icon.
3. Press the ACTION button to display the SET-UP Menu.

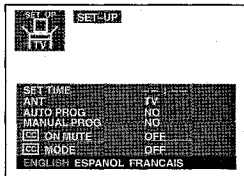


Figure 13. Setup for Menu Language

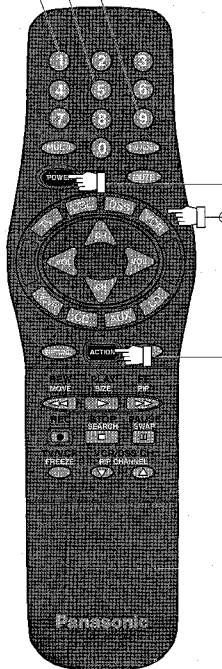
4. Press the CH ▲ or ▼ button to highlight ENGLISH ESPANOL FRANCAIS.
5. Press the VOL ◀ or ▶ button to select ENGLISH ESPANOL or FRANCAIS.
6. Press the ACTION button twice to exit Menu.

Programming The Remote Control Using Access Codes

The remote control can be set and used with other manufacturers components, by utilizing the **MODE SELECTION BUTTONS** for CABLE, DSS, VCR, RCVR (a Receiver or Amplifier), CD, LD, and AUX (for Cassette Players or a DVD.)

Code From Index Sheet

1 5 9



Preferred Procedure – Code Known

Procedure for setting up the remote using the numerical buttons.

- ☐ Determine brand of component.
- ☐ Identify code(s) associated with the brand in the infrared code index (located in this manual on pages 15 thru 18). Record all possible codes.
- ☐ Confirm that the device is plugged in and operating properly, then turn it OFF.

1 For a NON-ILLUMINATED remote:

Press and hold the **MODE** button and the **POWER** button simultaneously for at least 5 seconds.

FOR AN ILLUMINATED REMOTE:

Press and hold the **MODE** button and the **POWER** button simultaneously for at least 5 seconds. All of the Mode buttons will flash.

2 For a NON-ILLUMINATED remote:

Press the desired Mode button.

For an ILLUMINATED remote:

Press the desired Mode button. That Mode button will illuminate steadily. All other buttons will go out.

3 Enter the three digit code, by using the Remote Control Keyboard "0 through 9" buttons.

For an ILLUMINATED remote – If the proper code was entered, the Mode key will blink twice then go out.

4 Press **TEST** to send a test signal. If the code is correct, the selected component will turn on.

Note: Some brands may have multiple codes. If the component does not respond, repeat the procedure using each listed code until the device responds correctly.

- ☐ If an incorrect code is entered or entry of the code is not completed within 30 seconds, the previous settings will be maintained. For illuminated remote, the Mode key illuminated will go out.

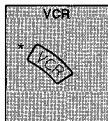
Figure 14. Remote Control – Programming

VCR Infrared Codes Index

The Universal Infrared Remote Control is capable of operating many brands of VCRs. Refer to page 14 for programming procedures.

Note: The Universal Remote Control memory is limited. Some models of VCRs may not operate. The Universal Remote Control is not designed to control all features that are available in all models.

After entering the proper infrared code, press the Remote VCR Selection Mode button (*). To operate the Remote VCR function buttons, refer to pages 10 and 11 for Remote Control Key Functions.



Code Index For VCRs			
VCR Brand	Code(s)	VCR Brand	Code(s)
Adventure	000	MTC	000, 240
Aiko	278	Multitech	000, 072
Aiwa	000	NEC	038, 041, 067
Akal	041, 061	Nikko	037
American High	035	Noblex	240
Asha	240	Olympus	035
Audiovox	037	Optimus	037, 048, 104
Beaumarck	240	Panasonic	035, 162, 225, 454
Bell & Howell	104	Pennney	035, 037, 038, 042
Broksonic	121, 184		240
Calix	037	Pentax	042
Canon	035	Philco	035
Carver	081	Phillips	035, 081
CCE	072, 278	Pilot	037
Citizen	037, 278	Pioneer	067
Colt	072	Protec	072
Craig	037, 047, 072, 240	Pulsar	039
Curtis Mathes	035, 041, 060	Quarter	046
Cybernex	240	Quartz	046
Daewoo	045, 278	Quasar	035
Dynatech	000	Radio Shack	000, 037
Electrohome	037	Radix	037
Electrophonic	037	Randax	037
Emerex	032	RCA	042, 060
Emerson	000, 002, 037, 043, 061, 121, 184, 278	Realistic	000, 035, 037, 046
Fisher	047, 104		047, 048, 104, 240
Fuji	033, 035	Ricoh	034
Funai	000	Runco	039
Garrard	000	Samsung	045, 240
GE	035, 060	Sanyo	039, 048
Goldstar	037, 038	Sansui	041, 067
Gradiente	000	Sanyo	046, 047, 104, 240
Harley Davidson	000	Scott	043, 045, 121, 184
Harman/kardon	038	Sears	035, 037, 042, 046, 047, 104
Harwood	072	Sharp	048
Headquarter	046	Shintom	072
Hi-Q	047	Shogun	240
Hitachi	041, 042	Singer	072
Jensen	041	Sony	032, 033, 034, 035
JVC	041, 067	STS	042
Kenwood	038, 041, 067	Sylvania	000, 035, 043, 081
KLH	072	Symphonic	000
Kodak	035, 037	Tatung	041
Lloyd	000	Teac	000, 041
Logik	072	Technics	035, 162
LXI	037	Teknika	000, 035, 037
Magnavox	035, 039, 081	TMK	240
Magnin	240	Toshiba	043, 045
Marantz	035, 081	Totevision	037, 240
Marta	037	Unitech	240
Matsushita	035	Vector	045
MEI	035	Vector Research	038
Memorex	000, 035, 037, 039, 046, 047, 048, 104, 240	Video Concepts	045, 061
MGA	043, 061	Videosonic	240
MGN Technology	240	Wards	000, 035, 042, 047, 048, 072, 240
Minolta	042	XR-1000	000, 035, 072
Mitsubishi	043, 061, 067	Yamaha	038
Motorola	035, 048	Zenith	033, 034, 039

Table 2. VCR Codes

CABLE CONVERTER BOX AND CD PLAYERS

Infrared Codes Index

The Universal Infrared Remote Control is capable of operating many brands of Cable Converter Boxes, and CD Players. Refer to page 14 for programming procedures.

Note: The Universal Remote Control memory is limited. Some models of Cable Converter Boxes and CD Players may not operate. The Universal Remote Control is not designed to control all features that are available in all models. After entering the proper infrared code, press the Remote **CBL** Selection Mode button (*). To operate the Remote Cable function buttons, refer to pages 10 and 11 for Remote Control Key Functions.

Codes For Cable Converter Box

Brand of Cable-TV Box	Code(s)	Brand of Cable-TV Box	Code(s)
ABC	003, 007, 008, 011, 013, 014, 017	Pioneer	144, 533
Archer	153	Pulsar	000
Century	153	RCA	021
Citizen	153	Regal	020, 259
Contec	019	Rambrandt	011
Dae Pyung	008	Runco	000
Garrard	153	Samsung	144
Gemini	015	Scientific Atlanta	008, 017, 477
General Instrument	011, 476	Signal	015
Goldstar	144	Signature	011
Hamlin	009, 020, 259	Sprucer	021
Hitachi	011	Starcorn	003, 015
Hytex	007	Stargate	015
Jasco	153	Starquest	015
Jerrold	003, 011, 012, 014, 015, 476	Tocom	012, 013
Memorex	000	Toshiba	000
Oak	007, 019	Tusa	015
Panasonic	000, 021, 107	Unika	153
Paragon	000	United Artists	007
Philips	153	United Cable	003
		Universal	153
		Zenith	000, 525

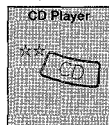
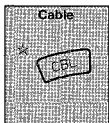
Table 3. Cable Converter Box Codes

Note: After entering the proper infrared code press the Remote **CD** Selection Mode button (☆☆). To operate the Remote CD Player function buttons, refer to pages 10 and 11 for Remote Control Key Functions.

Codes For CD Players

Brand of CD Players	Code(s)	Brand of CD Players	Code(s)
Aiwa	124, 157	Onkyo	101
CA Audio Lab	029	Optimus	000, 032, 037, 305, 426, 468
Carver	157	Panasonic	029, 367
Danon	003	Philips	157
DKK	000	Pioneer	032, 468
Emerson	305	Proton	157
Fisher	048	QED	157
Genexxa	032, 305	Quasar	029
Harman-Kardon	426	RCA	305
Hitachi	032	Rotel	157
JVC	072	SAE	157
Kenwood	028, 037, 048, 190	Sansui	157, 305
Krell	157	Scott	305
LXI	305	Sears	305
Magnavox	157	Sharp	037
Marantz	029, 157	Sherwood	426
MCS	029	Sony	000
Mission	157	Technics	029, 303
Nakamichi	147	Victor	072
NSM	157		

Table 4. CD Player Codes



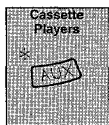
CASSETTE PLAYERS, RECEIVERS, and AMPLIFIERS

Infrared Codes Index

The Universal Infrared Remote Control is capable of operating many brands of Cassette Players, Receivers, or Amplifiers. Refer to page 14 for programming procedures.

Note: The Universal Remote Control memory is limited. Some models of Cassette Players, Receivers, and Amplifiers may not operate. The Universal Remote Control is not designed to control all features that are available in all models.

After entering the proper infrared code, press the Remote **AUX** Selection Mode button (*). To operate the Remote Cassette Player function buttons, refer to pages 10 and 11 for Remote Control Key Functions.



Code Index For Cassette Players			
Brand of Cassette Players	Code(s)	Brand of Cassette Players	Code(s)
Aiwa	029	Panasonic	272
Carver	029	Philips	029
Denon	076	Pioneer	027, 220
Kenwood	070	Sansui	029
Magnavox	029	Sherwood	337, 338
Marantz	029	Sony	170, 243
Nakamichi	147	Technics	229
Optimus	027, 220, 337, 338	Wards	027
		Yamaha	094, 097

Table 5. Cassette Players Codes

Note: After entering the proper infrared code, press the Remote **RCVR** Selection Mode button (*). To operate the Remote Receiver or Amplifier function buttons, refer to pages 10 and 11 for Remote Control Key Functions.



Code Index For Receivers And Amplifiers			
Brand of Receiver / Amplifier	Code(s)	Brand of Receiver / Amplifier	Code(s)
ADC	531	Panasonic	039
Aiwa	121, 158, 189	Penney	195
Carver	008, 042, 189, 269	Philips	189, 269
Casio	195	Pioneer	013, 014, 080, 300, 531
Clarinette	195	Quasar	039
Denon	004	RCA	531
Fisher	042, 219	Realistic	195
JVC	074	Sansui	189, 321
Kenwood	027, 186	Sanyo	219
Lloyd's	195	Sharp	186
Magnavox	189, 195, 269, 531	Sherwood	502
Marantz	039, 189, 269, 321	Sony	158
MCS	039	Technics	039, 208, 308, 309, 518
Modulaire	195	Victor	074
NAD	320	Wards	013, 014, 042, 080, 158, 189
Nakamichi	321, 347	Yamaha	176, 186, 354
Onkyo	135	York	195
Optimus	013, 080, 186, 219, 300, 531		

Table 6. Receivers & Amplifiers Codes

LASER DISC, DSS (Digital Satellite System), and DVD (Digital Videodisc) Infrared Codes Index

The Universal Infrared Remote Control is capable of operating selected brands of Laser Disc, DSS Digital Satellite System, and DVD (Digital Videodisc). Refer to page 14 for programming procedures.

Note: The Universal Remote Control memory is limited. Some models of Laser Disc, DSS Digital Satellite System, and DVD (Digital Videodisc) may not operate. The Universal Remote Control is not designed to control all features that are available in all models.

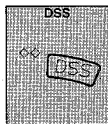
After entering the proper infrared code, press the Remote **LD Selection Mode** button (◊). To operate the Remote Laser Disc function buttons, refer to pages 10 and 11 for Remote Control Key Functions.



Codes For Laser Disc	
Brand of Laser Disc	Code(s)
Mitsubishi	059
NAD	059
Panasonic	204
Pioneer	059
Quasar	204
Sony	201

Table 7. Laser Discs Codes

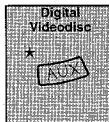
Note: After entering the proper infrared code, press the Remote **DSS Selection Mode** button (◊◊). To operate the Remote Satellite function buttons, refer to pages 10 and 11 for Remote Control Key Functions.



Codes For DSS (Digital Satellite System)	
Brand of Satellite	Code(s)
Panasonic	701
RCA	566
Sony	639

Table 8. Digital Satellite Systems Codes

Note: After entering the proper infrared code, press the Remote **AUX Selection Mode** button (*). To operate the Remote DVD (Digital Videodisc) function buttons, refer to pages 10 and 11 for Remote Control Key Functions.



Codes For DVD (Digital Videodisc)	
Brand of DVD	Code(s)
Panasonic	490

Table 9. Digital Videodiscs Codes

Notes

Disassembly for Service

Back Cover

Note: Configuration, type, and number of screws vary depending on the model of the Receiver serviced and the application; various models are covered in this Manual. Use same hardware when reassembling the receiver.

1. 4 screws at the top edge of the Receiver.
2. 4 screws at each side of the Receiver.
3. 5 screw around the plastic rear A/V bracket.

Note: Some boards are mounted on the Main Chassis (A-Board) and require extension cables when servicing. Cable kits are available from Matsushita Service Company, Part No. TXAZS011SER.

A-Board - Main Chassis

1. Secured to the chassis frame with 5 screws.
2. Remove the screws, disconnect the necessary connectors and lift the chassis out of the chassis frame.

Note: Some tie-wraps that secure the wire dressings may need to be unfastened for chassis removal.

C-Board - CRT Output

Plugs into the socket on the CRT neck.

R-Board - IR Remote Receiver (CT-32S20U)

Secured to the cabinet escutcheon by plastic clips. Use a small screw driver to lift the clips while pulling the board out.

S-Board - Second Tuner (CT-35G31U/UU)

Located to the left of the chassis frame. The S-Board is secured to the cabinet by three studs with one screw per stud. Each stud is connected to the cabinet with one screw. Remove the studs screws and remove the board.

X-Board - A/V 1 & 2, S-Video, TV Switching, Comb Filter

Connected to the Main Chassis (A-Board). It is the board located at the center of the A-Board. It is connected to the A-Board with 3 connectors. Pull on the X-Board, perpendicular to the A-Board, while releasing the snap tabs on connectors A1, A2 & A3.

Y-Board - PIP Processing

Connected to the Main Chassis (A-Board). It is the board located closest to the left edge of the A-Board. The Y-Board is connected to the A-Board with 2 connectors. Pull on the Y-Board, perpendicular to the A-Board, while releasing the snap tabs on connectors A31 & A32.

Z-Board - Pincushion Correction

Connected to the Main Chassis (A-Board). It is located at the top right corner of the A-Board and it is connected to the A-Board with 1 connector. Pull on the Z-Board, perpendicular to the A-Board, while releasing the snap tabs on connectors A7.

L-Board - Keyboard Push Button Assembly

Secured to the cabinet front with 2 screws.

Speakers

Each speaker is secured to the cabinet's front with 4 screws.

A/V Block

Soldered to the X-Board. It is attached to the rear A/V bracket with 3 screws.

Rear A/V Bracket

Attached to the A/V block with 3 screws, and to the antenna block with 2 screws. The bracket is secured to the chassis frame under 3 tabs.

Antenna Block

Attached to the rear A/V bracket with 2 screws.

Disassembly for CRT Replacement

1. Discharge the CRT as instructed in the **Safety Precautions** (see page 2).
2. Disconnect the yoke (DY) plug, degaussing coil (DEG) plug and the CRT 2nd anode button from the main board.
3. Remove the C-Board from the CRT base and unplug the black wires (CRT dag ground) C11 & C17 from the board.
4. Disconnect the A11, A12, A41 and SP plugs from the A-Board.
5. Disconnect the connectors attached to the S-Board (S5, S6 & S8 and the wire attached to the tuner).
6. Lift the Main Chassis (A-Board) and all mounted boards completely out with the CRT Board attached.

CRT Replacement

1. Perform **Disassembly for CRT Replacement** procedure.
2. Insure that the CRT H.V. anode button is discharged before handling the CRT. Read the **Safety Precautions** (see page 2) on handling the picture tube.
3. Remove the components from the CRT neck and place the cabinet face down on a soft pad.
4. Note the original order of the CRT mounting hardware as they are removed from the CRT mounting brackets at each corner of the CRT.
5. Remove the CRT with the degaussing coil and the dag ground braid attached.
6. Note the original locations and mounting of the degaussing coil and the dag ground assembly to insure proper reinstallation on the replacement CRT.

To remove and re-mount the degaussing coil: The degaussing coil is held in place by clampers fastened to the CRT corner ears.

These clampers must be installed onto the replacement CRT prior to mounting the degaussing coil.

To remove and re-mount the dag ground braid:

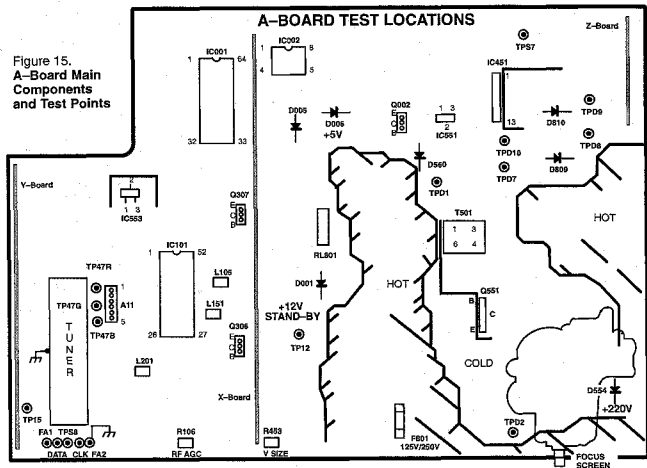
- a. Unhook the coil spring from the bottom corners of the CRT ears.
 - b. Release the braid loop from the upper corners of the CRT ears.
7. Mount the dag ground braid on the replacement CRT. Position the degaussing coil with new ties. Dress coil as was on the original CRT.
 8. Replace the components on the CRT neck and re-install into cabinet. Verify that all ground wires and circuit board plugs get connected.

Chassis Service Adjustment Procedures

All service adjustments are factory preset and should not require adjustments unless controls and/or associated components are replaced.

Note: Connect the (-) lead of the voltmeter to the appropriate ground. Use T801 pin F2 or to IC801's heat sink when the HOT ground symbol (⚡) is used. Otherwise, use COLD ground (⚡) — Tuner shield, IC451's heat sink or FA2.

Figure 15.
A-Board Main
Components
and Test Points



MOMENTARILY CONNECT A JUMPER FOR ENTERING SERVICE MODE (FA1 to FA2 or TP8 to TP3)

131.0V B+ Voltage Confirmation

1. Set the **Bright** and the **Picture** to Minimum by using the Picture Menu.
2. Connect a DVM between TPD7 or cathode of D809 and cold ground.
3. Confirm that B+ voltage is 131.2V $\pm$ 2.0V. This voltage supplies B+ to the Horizontal Output & Flyback circuits.

Source Voltage Chart

120V AC line input. Set the **Bright** and the **Picture** to Minimum by using the Picture Menu. Use cold ground (⚡) for the (-) lead of the DVM.

IC553 pin 3	+5.0V $\pm$ 0.25V
IC551 pin 3	+9.0V $\pm$ 0.5V
TPD9	+16.5V $\pm$ 2V
TPD10	+18.0V $\pm$ 2V
Cathode of D554	+22.7V $\pm$ 15V
TPD8	+26.0V $\pm$ 2V

Adjust Picture menu for normalized video adjustments.

B+ 5V Source Voltages

Volatile 5V:

Tuner BPL, IC101 (B+ V_{cc}), RF AGC (R106).

MPU 5V:

Emitter Q002 = IC001 (V_{DD}).

Standby 5V:

Cathode D005, IC001 (Key in 1), I²C EEPROM (IC002), TIMER LED, Remote Receiver.

B+ 9V Source Voltage

Cathode D560 = IC101 (B+ V_{cc}) (HOLD DOWN) (AFC OUT), Q306 (Video), Q307 (Closed Caption E.F.), Tuner (BM).

B+ 12V (Stand-by) Note: +16V when power is on
Cathode D001 = RL801 (on-off relay), Q002 (+5V Reg), IC101 (Horiz. V_{cc}).

High Voltage Check

1. Select an active TV channel and confirm that horizontal is in sync.
2. Adjust Brightness and Picture using Picture Icon menu so video just disappears.
3. Confirm B+ 131V is within limit.
4. Using a high voltage meter confirm that the High Voltage is 29.25kV $\pm$ 1.25kV or 31.5kV $\pm$ 1.25kV for 32" or 35" Receivers respectively.

Purity and Convergence Procedure

Adjustment is necessary only if the CRT or the deflection yoke is replaced or if the setting was disturbed. The complete procedure consists of:

1. Initial static convergence.
2. Setting the purity.
3. Final static convergence.

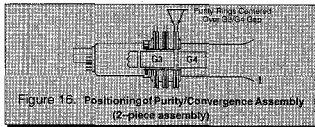
When the CRT or the Yoke is Replaced

Place the yoke on the CRT neck (do not tighten the clamp).

For a 2-piece assembly (see Figure 16):

Position purity/convergence assembly as shown and tighten clamp snugly. Cut the hot-melt glue seal on assembly and place like tabs of purity device together at 12 o'clock to reduce its magnetic field effect. Manually degauss the CRT.

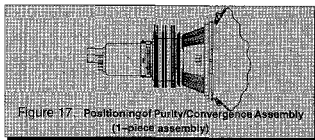
Turn the Receiver ON and slide the deflection yoke back and forth on the neck of the CRT. Stop at the position that produces a near white, uniform raster.



For a 1-piece assembly (see Figure 17):

Place like tabs of purity devices together at 12 O'Clock to reduce any magnetic field effect. Manually degauss the set.

Connect a Black/White pattern generator and tune the receiver to the signal. Slide the deflection yoke & purity ring assembly back and forth on the CRT neck. Stop at a position that produces a near white signal.



Initial Center Static Convergence

Connect a dot/crosshatch generator to the Receiver and tune in signal. Observe misconvergence at center of the screen only.

Adjust the 4 pole magnet (center rings); separate tabs and rotate to converge blue with red.

Adjust the 6 pole magnet (rear rings); separate tabs and rotate to converge blue and red (magenta) with green.

Note: Precise convergence at this point is not important.

Purity Adjustment

When the Receiver is in the Serviceman Mode for making electronic adjustments, press the **Recall** button on the Remote Control to enter Purity Check. (See **Service Adjustments Electronic Controls**.)

Operate the Receiver for 60 minutes using the first Purity check field (white screen) to stabilize the CRT.

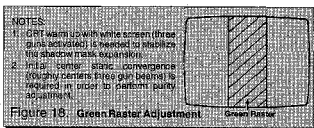
Fully degauss the Receiver by using an external degaussing coil.

Press the **Recall** button on the Remote Control again until the Purity Check (green screen) appears.

For a 2-piece assembly (see Figure 16):

Loosen the deflection yoke clamp screw and move the deflection yoke back as close to the purity magnet as possible.

Adjust the front rings to set the vertical green raster precisely at the center of the screen (see Figure 18).



Slowly move the deflection yoke forward until the best overall green screen is displayed.

For a 1-piece assembly (see Figure 17):

Slowly move the deflection yoke and purity rings assembly toward the CRT board and adjust the purity magnet rings to set vertical green raster at center of screen (see Figure 18).

Gradually move the deflection yoke & purity rings forward and adjust for the best overall green screen.

Continue from here for either assemblies:

Tighten the deflection yoke clamp screw.

Press the **Recall** button on the Remote Control again until the Purity Check (blue screen) and (red screen) appear and observe that good purity is obtained on each respective field.

Press the **Recall** button on the Remote Control again until Purity check (white screen) appears. Observe the screen for uniform white. If purity has not been achieved, repeat the above procedure.

Final Convergence Procedure (see Figure 19 through Figure 21):

Note: Vertical size and focus adjustments must be completed prior to performing the convergence adjustment. Connect a dot pattern generator to the Receiver. The **Brightness** level should not be higher than necessary to obtain a clear pattern.

Converge the red and blue dots at the center of the screen by rotating the 4 pole (R with B) Static Convergence Magnets.

Align the converged red/blue dots with the green dots at the center of the screen by rotating the 6 pole (R/B with G) Static Convergence Magnets. Melt wax with soldering iron to reseat the magnets.

Slightly tilt vertically and horizontally (do not rotate) the deflection yoke to obtain a good overall convergence.

If convergence is not reached at the edges, insert permalloy (see following section) from the DY corners to achieve proper convergence. Recheck for purity and readjust if necessary.

Permalloy Convergence Corrector Strip (Part No. OFMK014ZZ)

This strip is used in some sets to match the yoke and CRT for optimum convergence. If the yoke or CRT is replaced, the strip may not be required.

First converge the set without the strip and observe the corners.

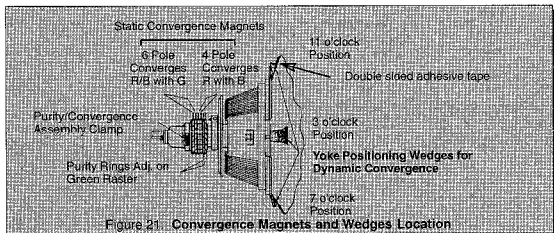
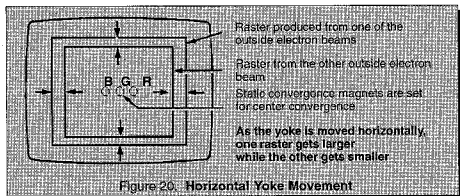
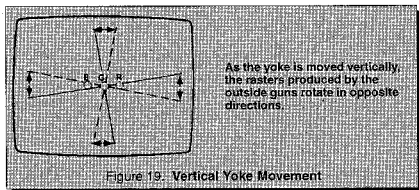
After vertical adjustment of the yoke, insert wedge at 11 o'clock position, then make the horizontal tilt adjustment.

Secure the deflection yoke by inserting two side wedges at 3 and 7 o'clock positions.

Apply adhesive between tab (thin portion) of wedge and CRT and place tape over the tab to secure to the CRT.

If correction is needed:

1. Place strip between CRT and yoke, in quadrant needing correction. Slowly move it around for desired results.
2. Press adhesive tightly to the CRT and secure with tape.



Serviceman Mode (Electronic Controls)

This Receiver has electronic technology using the I²C Bus Concept. It performs as a control function and it replaces many mechanical controls. Instead of adjusting mechanical controls individually, many of the control functions are now performed by using the "On Screen Display Menu". (The **Serviceman Adjustment Mode**.)

Note: It is suggested that the technician reads all the way through and understand the following procedure for Entering/Exiting the **Serviceman Adjustment Mode**; then proceed with the instructions working with the Receiver. When becoming familiar with the procedure, the Flow Chart for Serviceman Mode may be used as a quick guide.

Entering Serviceman Mode:

- While the Receiver is ON and operating in Normal Mode, momentarily short test point FA1 to cold ground (rh) FA2. (TP pin 8 to pin 3)

"The Receiver enters the Aging Mode".

Yellow letters "CHK" appear in the upper left corner of the CRT.

(The Volume will adjust rapidly.)

- Press the **Action** and the **Volume Up** buttons on the Receiver Control Panel simultaneously.

"The Receiver enters the Serviceman's Mode".

The letters in "CHK" turn red.

(The Volume will adjust normally.)

(All customer controls are set to a nominal level.)

- Press the **Power** button on the Remote Control to select one of five Serviceman Adjustment Modes.
 - B = Serviceman VCJ SUB ADJUSTMENTS
 - C = Serviceman CUTOFF ADJUSTMENTS
 - S = Serviceman OPTIONS ADJUSTMENTS
 - M = Serviceman MTS ADJUSTMENTS
 - "CHK" = Normal operation of CHANNEL ▲ and CHANNEL ▼ and VOLUME ▲ and VOLUME ▼

Press the **Power** button on the Remote Control to select the Serviceman CRT Adjustment Mode.

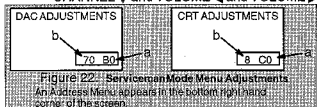
For CRT Adjustments:

- Press **Channel** ▲ or ▼ on the Remote Control to select one of the 6 available Service Adjustments (a in Figure 22).

Important Note: Write down the original value set (b in Figure 22) for each address adjustment before modifying anything. It is easy to erroneously adjust the wrong item.

- Press **Volume** ▲ or ▼ on the Remote Control to adjust the level of the selected Service Adjustment.

C0 = Horiz. Center
 C1 = RED Cutoff
 C2 = GRN Cutoff
 C3 = BLU Cutoff
 C4 = RED Drive
 C5 = BLU Drive



For DAC Adjustments:

- Press **Channel** ▲ or ▼ on the Remote Control to select one of the 6 available Service Adjustments (a in Figure 22).

Important Note: Write down the original value set (b in Figure 22) for each address before modifying anything. It is easy to erroneously adjust the wrong item.

- Press **Volume** ▲ or ▼ on the Remote Control to adjust the level of the selected Service Adjustment.

B0 = Sub Bright
 B1 = Sub Color
 B2 = Sub Tint
 B3 = Sub Contrast
 B4 = Video Adjust.
 B5 = Audio Adjust.

Adjustment Range and Default level values for Service Adj.

CRT Adjustment	Adj. Range	Default Level
Horiz Centering (C0)	0 ~ 15	8
RED Cutoff (C1)	*0 ~ 255	128
GRN Cutoff (C2)	*0 ~ 255	128
BLU Cutoff (C3)	*0 ~ 255	128
RED Drive (C4)	0 ~ 255	128
BLU Drive (C5)	0 ~ 255	128

*Adjustment indicated in 2 steps (0 ~ 255) ➡ (1 ~ 255)
(see b in Figure 22)

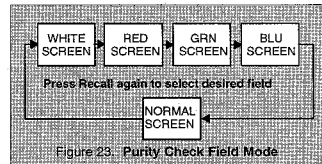
To Check Purity:

Press the **Recall** button on the Remote Control when in Aging or Serviceman Modes to enter the Purity Field Check Mode.

Note: The Receiver must be in the Serviceman Mode to display the red, green & blue purity fields.

Adjustment Range and Default level values for Service Adj.

Service Adjustment	Adj. Range	Default Level
Sub Bright (B0)	0 ~ 255	128
Sub Color (B1)	0 ~ 63	33
Sub Tint (B2)	0 ~ 63	33
Sub Contrast (B3)	0 ~ 63	34
Video Adjustment (B4)	0 ~ 15	8
Audio Adjustment (B5)	0 ~ 15	8



Press the **Power** button on the Remote Control to select the **Serviceman Options Adjustment Mode**.

For Options Adjustments:

1. Press **Channel** ▲ or ▼ on the Remote Control to select one of the 12 available Options Adjustments (a in Figure 22).

Important Note: Write down the original value set (b in Figure 22) for each address before modifying anything. It is easy to erroneously adjust the wrong item.

2. Press **Volume** ◀ or ▶ on the Remote Control to adjust the level of the selected Service Adjustment.

S0 = PIP Color
S1 = PIP Tint
S2 = PIP Sync
S3 = Upper 1/9
S4 = Lower 1/9
S5 = Left 1/9
S6 = Right 1/9
S7 = Upper 1/16
S8 = Lower 1/16
S9 = Left 1/16
Sa = Right 1/16
Sb = Clock Adj.

Adjustment Range and Default level values for Service Adj.

Options Adjustment	Adj. Range	Default Level
PIP Color (S0)	0 ~ 127	25
PIP Tint (S1)	0 ~ 127	55
PIP Sync (S2)	0 ~ 7	04
Upper 1/9 (S3)	0 ~ 255	229
Lower 1/9 (S4)	0 ~ 255	111
Left 1/9 (S5)	0 ~ 255	27
Right 1/9 (S6)	0 ~ 255	123
Upper 1/16 (S7)	0 ~ 255	229
Lower 1/16 (S8)	0 ~ 255	93
Left 1/16 (S9)	0 ~ 255	27
Right 1/16 (Sa)	0 ~ 255	137
Clock Adj. (Sb)	0 ~ 255	128

Press the **Power** button on the Remote Control to select the **Serviceman MTS Adjustment Mode**.

For MTS Adjustments:

1. Press **Channel** ▲ or ▼ on the Remote Control to select one of the 5 available MTS Adjustments (a in Figure 22).

Important Note: Write down the original value set (b in Figure 22) for each address before modifying anything. It is easy to erroneously adjust the wrong item.

2. Press **Volume** ◀ or ▶ on the Remote Control to adjust the level of the selected Service Adjustment.

M0 = Input Level
M1 = Stereo PLLVCO
M2 = Filter
M3 = Low-level Separation
M4 = High-level Separation

Adjustment Range and Default level values for Service Adj.

MTS Adjustment	Adj. Range	Default Level
Input Level (M0)	0 ~ 63	31
Stereo PLLVCO (M1)	0 ~ 63	31
Filter (M2)	0 ~ 63	31
Low-level Sep. (M3)	0 ~ 63	31
High-level Sep. (M4)	0 ~ 63	31

IMPORTANT NOTE:
Always Exit the Serviceman Mode following Adjustments.

Exiting the Serviceman Mode:

1. Press the **Action** and the **Power** buttons on the Receiver simultaneously for at least 2 seconds.
"The Receiver exits Serviceman Mode".

The Receiver momentarily shuts off; then comes back on tuned to channel 3 with a preset level of sound.

Helpful Hints

Quick Entry To Serviceman Mode:

At times when minor adjustments need to be done to the electronic controls, the method of Entering the Serviceman Mode without removal of the cabinet back is as follows using the Remote Control:

1. Select SET-UP icon and select CABLE mode.
2. Select TIME icon and set SLEEP timer for 30.
3. Press ACTION button twice to cancel Icon Menus. Tune to Channel 124.
Adjust VOLUME to Minimum (0).
On Receiver press the VOL ◀ button (decrease). Red "CHK" appears in upper corner.

To toggle between Aging and Serviceman modes:

While the "CHK" is displayed on the left top corner of the CRT, pressing the **Action** and the **Volume UP** buttons on the Receiver simultaneously will toggle between the modes.

Instructional Flow Chart for Serviceman Mode

Caution: Always EXIT Serviceman Mode

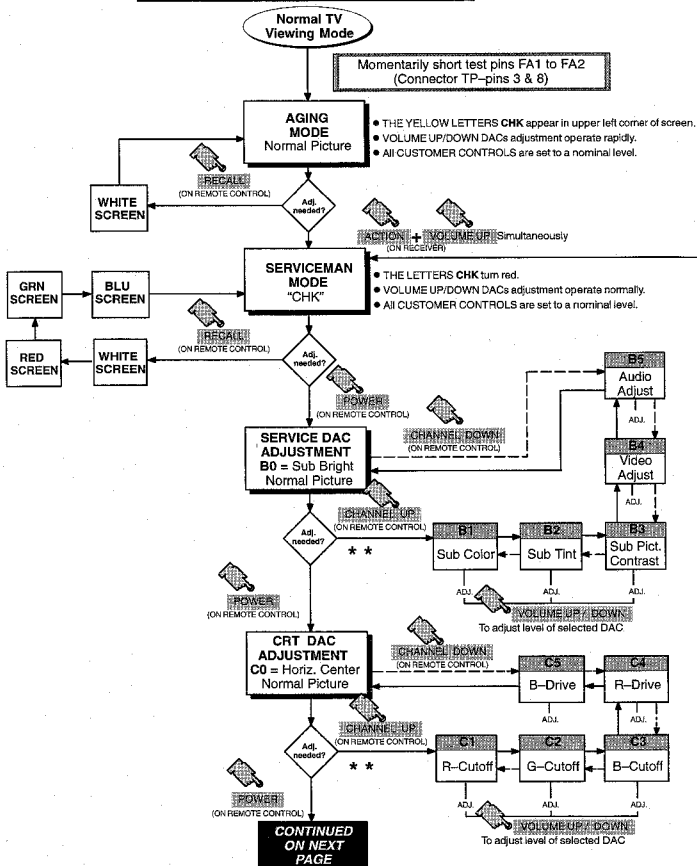


Figure 24. Flow Chart for Serviceman Mode

Instructional Flow Chart for Serviceman Mode – Continued

** Important Note

Before making any DAC adjustments note the existing values!

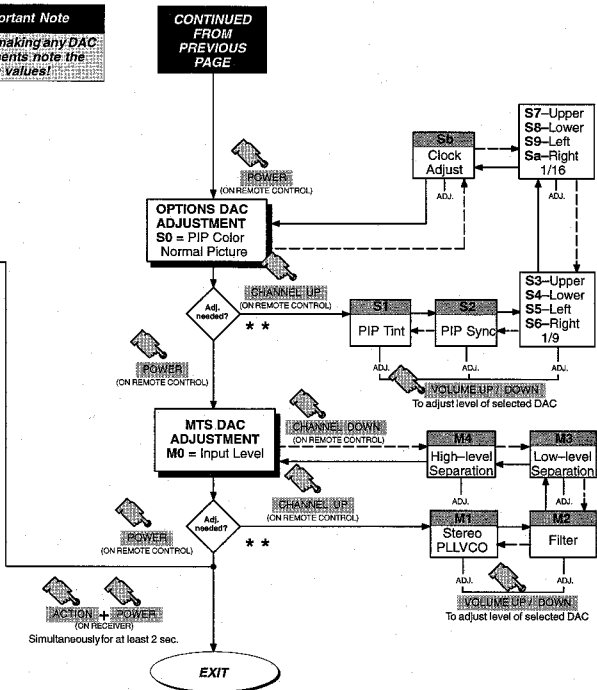


Figure 25. Flow Chart for Serviceman Mode (Continued)

Note: When **EXITING**, the Receiver shuts off; then turns on, **TUNED TO CHANNEL 3 WITH A PRESET SOUND LEVEL.**

Any Programmed Channels, Channels Caption data and some other user defined settings will be erased.

Service Adjustments (Electronic Controls)

Sub-Brightness

Serviceman DAC Adjustment (B0)

Adjustment of this control is important for setting proper operation of customer brightness and picture controls. This adjustment must be made after Sub-Contrast or Color Temperature adjustments are made. **Do not adjust SCREEN** after the Sub-Brightness is set.

Preparation:

Apply a color bar signal with 100 IRE white and 7.5 IRE black. (Switch Color to "OFF" on the signal generator.) Operate the Receiver for a minimum of 10 minutes prior to performing this adjustment.

Procedure:

In the Serviceman Mode for making electronic adjustments, select the DAC adjustment (B0) and adjust until the black bar starts to look grey. Then decrease the level to the point where grey turns to black.

Video Adjustment Level

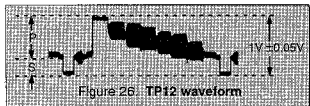
Serviceman DAC Adjustment (B4)

Preparation:

1. Obtain an NTSC color bar pattern with 100 IRE white and 87.5% modulation.
2. Connect the oscilloscope to TP12. Use cold ground for scope connection. Set the scope at Horizontal Sweep rate (20 μ s) time base.

Procedure:

1. In the Serviceman Mode for making electronic adjustments, select DAC Video Adjustment Level (B4) and adjust for 1V from sync tip to white level. See Figure 26.



2. Check that the sync signal amplitude (ratio between the sync signal to detection output) is within the range of 30 $\pm$ 5% ($S/(S+P) = 30 \pm 5\%$).
3. Set the DAC Sub-Contrast Adjustment (B3).

Sub-Contrast

Serviceman DAC Adjustment (B3)

This adjustment is factory set. **Do not adjust** unless repairs are made to associated circuit, the CRT Board or when the CRT is replaced.

Preparation:

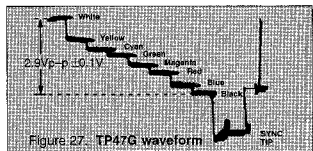
1. Apply a color bar signal pattern with 87.5% modulation, 70% saturated color bar with a 100 IRE white and 7.5 black.

Note: The pattern used in this procedure is an EIA color bar pattern with 87.5% modulation with 100 IRE white and 7.5 black. Correlate the information in this procedure to the pattern used if another signal is used.

2. Connect the oscilloscope to TP47G on the A-Board. Set the scope time base to 20 μ s (horizontal).
3. Connect a jumper from TPD2 to ground (rfl).

Procedure:

1. In the Serviceman Mode for electronic adjustments, select DAC Sub-Contrast Adjustment (B3) and adjust for 2.9Vp-p $\pm$ 0.1V from white level to black level on video waveform (see video waveforms detail, Figure 27).



2. Remove the jumper (Preparation steps 3).

Tint/Color Adjustment

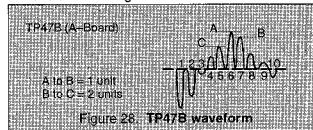
Serviceman DAC Adjustment (B2) (B1)

Preparation:

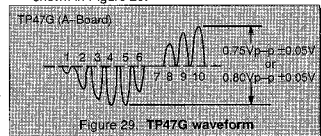
1. Apply a rainbow color bar signal.
2. Connect the oscilloscope to TP47B (A-Board).
3. Connect a jumper from TPD2 to GND (rfl).

Procedure:

1. In the Serviceman Mode for making electronic adjustments, select DAC Sub-Tint Adjustment (B2). Adjust until the waveform measured is as the one shown in Figure 28.



2. Connect the oscilloscope to TP47G (A-Board).
3. Select DAC Sub-Color Adjustment (B1) and adjust for peak to peak amplitude to be 0.75Vp-p $\pm$ 0.05V for 32" and 0.80Vp-p $\pm$ 0.05V for 35" Receivers, as shown in Figure 29.



4. Remove the jumper (Preparation step 3).

Color Temperature Adjustment (B/W Tracking)

Serviceman DAC Adjust. (C1) (C2) (C3) (C4) (C5)

Minor Touch-Up Method

OBSERVE low and high brightness areas of a B/W picture for proper tracking. Adjust only as required for "good gray scale and warm highlights".

1. LOW LIGHT areas - In Serviceman Mode for making electronic adjustments, select Cutoff (C1) RED, (C2) GRN, (C3) BLU and adjust the picture for grey.
2. HIGH LIGHT areas - In Serviceman Mode for making electronic adjustments, select Drive (C4) RED, (C5) BLU and adjust the picture for warm whites.

Complete Adjustment

Preparation:

1. Turn the Receiver "ON" and allow 10 minutes warm up at high brightness.
2. Apply a color bar signal with color "OFF".
3. Turn the SCREEN control (part of FBT T551) fully counterclockwise.

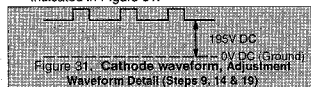
Procedure:

Preset Serviceman DACs C1, C2 and C3 levels to 128 for best results.

1. Connect the oscilloscope to TP35 (CRT-Board).
2. In Serviceman Mode for making electronic adjustment, select the Sub-Bright DAC (B0).
3. Connect a jumper from TPS8 to FA2, (connector TP pin 6 to pin 3).
4. Observe the oscilloscope waveform at Horizontal rate and adjust the Serviceman Mode Sub-Bright DAC (B0) level until a scanning period of 2.4V above DC ground is measured, as indicated in Figure 30.



5. Remove the jumper. (Step 3)
6. Connect the scope to GRN Cathode (KG) on the CRT-Board.
7. In the Serviceman Mode for making electronic adjustments, select the GREEN CUTOFF DAC (C2).
8. Connect a jumper from TPS8 to FA2, (connector TP pin 6 to pin 3).
9. View scope trace at Horizontal rate and adjust the Serviceman Mode DAC (C2) level until a scanning period of 195V above DC ground is measured, as indicated in Figure 31.



10. Remove the jumper. (Step 8)
11. Connect the scope to the RED Cathode (KR).
12. In Serviceman Mode for making electronic adjustments, select the RED CUTOFF DAC (C1).
13. Connect a jumper from TPS8 to FA2, (connector TP pin 6 to pin 3).

14. View the scope trace and adjust the Serviceman Mode DAC (C1) for the scanning period to be 195V above DC ground. (See Figure 31)
15. Remove the jumper. (Step 13)
16. Connect the scope to the BLU Cathode (KB).
17. In Serviceman Mode for making electronic adjustments, select the BLU CUTOFF (C3).
18. Connect a jumper from TPS8 to FA2, (connector TP pin 6 to pin 3).
19. View the scope trace and adjust the Serviceman Mode DAC (C3) for the scanning period to be 195V above DC ground. (See Figure 31)
20. Turn the Screen Control (part of FBT) slowly clockwise until a color horizontal line appears.
21. With the other two colors Serviceman Mode DAC CUTOFF adjustments (C1) RED, (C3) BLU; increase the colors to create a white horizontal line.
22. Remove the jumper. (Step 18)
23. Confirm that a good gray scale is established by viewing B/W color bar pattern.
24. In the Serviceman Mode for making electronic adjustments select the DAC DRIVE adjustments (C4) RED, (C5) BLU and adjust for warm white in a white color bar pattern.
25. EXIT the Serviceman Mode.
26. Adjust the Picture Menu Video Adjustments **Bright** and **Picture** from low scale to high scale and check Black and White tracking.
27. If correction is needed: Re-Enter the Serviceman Mode and perform the **Minor Touch - Up Method**.
28. Perform **Sub-Brightness** Adjustment procedure.

Horizontal Centering

Serviceman DAC Adjustment (C0)

Preparation:

Connect a crosshatch generator.

Procedure:

1. In the Serviceman Mode for making electronic adjustments. Select the Horizontal Centering Adjustment DAC (C0) and adjust until the center of the crosshatch pattern is centered on CRT.
2. EXIT the Serviceman Adjustment Mode.

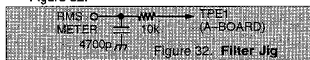
Audio Adjustment

Serviceman DAC Adjustment (B5)

This adjustment is factory set and needs to be performed only when IC002 or IC101 is replaced.

Preparation:

1. Apply the following signal at the antenna (70dB $\pm$ 5dB, 75 Ω open P/S 10dB); audio signal set to monaural, 300Hz. 100% modulation; video input of 100IRE flat field, 30% modulation.
2. Connect the RMS Meter with filter jig as shown in Figure 32.



Procedure:

1. In the Serviceman Mode for making electronic adjustments, select the Audio Adjustment DAC (B5) and adjust until 150mV RMS $\pm$ 7.5mV RMS is measured.
2. EXIT the Serviceman Adjustment Mode.

MTS Circuit Adjustments

The MTS Circuit Adjustments require four steps:

1. Stereo VCO Adjustment.
2. Filter Adjustment.
3. Input Level Adjustment.
4. Stereo Separation Adjustment.

Stereo VCO Adjustment (M1)

Preparation:

1. Connect a 1k Ω resistor between TP14 and ground.
2. Connect a 22 μ F, 16V capacitor between TPA10 and ground.
3. Connect a frequency counter to TPE11.

Note: 15 seconds aging is required prior to performing the following procedure.

Procedure:

Adjust the MTS Stereo PLL VCO (M1) until the frequency counter measures 15.534kHz $\pm$ 50Hz.

Filter Adjustment (M2)

Preparation:

1. Connect a 1k Ω resistor between TP14 and ground.
2. Connect a 22 μ F, 16V capacitor between TPA10 and ground.
3. Short TPS8 to ground.
4. Connect a signal generator (sine wave) to TPE1.
5. Connect a scope to TPE10.

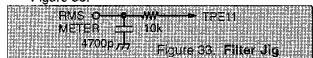
Procedure:

1. Apply the following signal from the signal generator: 15.734kHz, 100mV rms, sine wave.
2. Adjust the MTS Filter Adjustment (M2) until the amplitude displayed on the scope is minimum.

Input Level Adjustment (M0)

Preparation:

1. Connect an RMS meter with filter jig as shown in Figure 33.



2. Connect an RF signal generator to the RF antenna input.

Procedure:

1. Apply the following signal from the RF signal generator:
Video: 100 IRE flat field, 30% modulation.
Audio: 300Hz, 100% modulation, monaural (70 $\pm$ 5dB, 75 Ω OPEN, P/S 10dB).
2. Adjust the MTS Input Level Adjustment (M0) until the voltage measured is 212 $\pm$ 10.5mV rms.

Stereo Separation Adjustments (M3 & M4)

Preparation:

1. Connect an RF signal generator to the RF antenna input.
2. Connect a scope to TPE11.

Procedure:

1. Apply the following signal from the RF signal generator:
Video: 100 IRE flat field, 30% modulation.
Audio: 300Hz, 30% modulation, stereo (left only) (70 $\pm$ 5dB, 75 Ω OPEN, P/S 10dB).
2. Adjust the MTS Low-Level Separation Adjustment (M3) until the amplitude displayed on the scope is minimum.
3. Apply the following signal from the RF signal generator:
Video: 100 IRE flat field, 30% modulation.
Audio: 3kHz, 30% modulation, stereo (left only) (70 $\pm$ 5dB, 75 Ω OPEN, P/S 10dB).
4. Adjust the MTS High-Level Separation Adjustment (M4) until the amplitude displayed on the scope is minimum.
5. Repeat above steps 2 through 4 until the amplitude is at minimum for both signals.

Clock Adjustment (Sb)

Preparation:

Connect the frequency counter from TPS1 (IC001 Pin 13) to cold ground (ch).

Note: Frequency Counter probe capacitance should be 8pF or less.

Procedure:

1. Turn the Receiver "OFF" with the AC power applied.
2. Measure TPS1 (IC001 pin 13) for the frequency of the waveform and record the reading.

Note: Pin 13 measurement must have at least four digits of resolution following the decimal point Example: 000.0000

3. Turn the Receiver back "ON".
4. Place the Receiver into Serviceman Mode for making electronic adjustment, select the Clock Adjustment DAC (Sb).
5. Calculate and set Sb based on the following formula:

$$Sb = 128 + 0.901 \times 10^6 \times (244.1406 - \text{pin } 13 \text{ [Hz]})$$

244.1406

Note: Pin 13 measurement will not change regardless of the value stored in Sb.

Service Adjustments (Mechanical Controls)

Note: To locate the referenced components on schematics check the vicinity of the component indicated in the parentheses.

RF AGC Delay R106 (IC101 pin 29)

Adjust only if overloading on strong signal or if busy background (snow) is present on moderate strength signals.

1. Adjust the RF AGC control, R106, until snow appears, then adjust the control until snow is eliminated.
2. Check all channels for optimum setting.

AFT Field Adjustment L151 (IC101 pin 32)

1. Select TV signal mode from the Menu.
2. Defeat AFT by applying a jumper from TPS7 (R066) to ground ().
3. Connect a DVM to the AFT test point, TP16.
4. Use the Remote Control to check all the active High Band channels 7-13 for AFT voltage range. Select a channel where the AFT voltage measured is in approximate center of the voltage range.
5. Adjust L151 for $4.6V \pm 0.1V$ at TP16.
6. Check all the active channels for proper AFT correction. Touch up L151 if required. Remove the jumper installed in step 2.

Note: Do not use the TV/CABLE channel with offset carriers for adjustment or in determination of the low and high range of the AFT voltage.

Audio Alignment L201 (IC101 pin 25)

1. Select an active TV channel.
2. Attenuate the signal (loosely couple antenna lead or use RF attenuator pad) for noisy sound. Adjust L201 for maximum sound. Signal to noise ratio is best when L201 is peaked.
3. Connect an antenna or remove the RF attenuator for strong signal.

VCO Field Alignment L105 (IC101 pins 36 & 37)

1. Connect a balance antenna and select a midband channel (Ch 10, 11 or 12)
2. Attenuate the signal strength for a weak noisy video.
3. While observing the picture tube, adjust L105 until best picture appears.
4. Change channels and observe that they are tuning properly.
5. If the channel monitored is not clear, repeat steps 1, 3 and 4 while applying a stronger signal.

Comb Filter Adjustment R3215 & L3202 (Q3202 on X-Board)

1. Connect a Signal Generator to the Video-In jack and apply a RED flat field color.

Note: Video input level is approximately $2V_{p-p}$.

2. Connect a scope between A3 pin 5 (or TP47G or TP35) and ground.
3. While observing the scope adjust R3215 until chroma level is minimized.
4. While observing the scope adjust L3202 until chroma level is minimized.
5. Repeat above steps 3 and 4 two or three more times making sure that the chroma level is kept to minimum.

Vertical Size R453 (IC451 pin 3)

1. Turn the VERTICAL SIZE control, R453, CCW until the top and the bottom edges of the raster are visible.
2. Adjust the VERTICAL SIZE control CW until the top and the bottom of the raster touch the bezel edge. Advance SIZE control CW an additional 30 degrees. This will be approximately 10% overscan. Linearity adjustment is done automatically when the size is being adjusted. (Best results can be obtained with a round test pattern.)

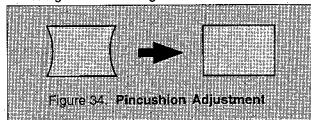
Pincushion Correct (R761) & Horizontal Width (R760) Z-Board

Preparation

1. Connect crosshatch pattern generator.
2. Normalize the PICTURE Menu Video Adjustments.
3. Adjust Horizontal Width (R760) to MID position.

Procedure

1. Adjust Pincushion Correct Control (R761) for the straightest left and right vertical lines.



2. If needed, adjust Horizontal Width (R760). Adjust for equal horizontal size of right side and left side boxes.

Focus (Part of T551)

Preparation:

Connect a Signal generator and select a dot pattern.

Procedure:

Adjust the FOCUS control to obtain the sharpest and clearest dot pattern.

- a. adjust for best center.
- b. adjust for best area between the center and top right corner.

AIS (Artificial Intelligence Sound)

This receiver uses Artificial Intelligence (AI) Sound to modulate abrupt changes in the sound volume level. It is primarily designed to prevent sudden loud changes in sound volume, such as those which occur when a television program is interrupted by a commercial. It also equalizes the maximum volume level when switching between different channels or when switching between broadcast and other A/V sources.

The AIS circuit is incorporated into the system through the use of an Automatic Gain Circuit, IC2451, which is located on the A-Board. AIS activation is MPU controlled through the IC's switch terminal at pin 7. Right and left channel sound enters the circuit at pins 1 and 10 respectively, where they are sampled, then either amplified or dampened according to preset levels. The "streamlined" sound is then fed through pins 3 and 8 (left and right channels respectively).

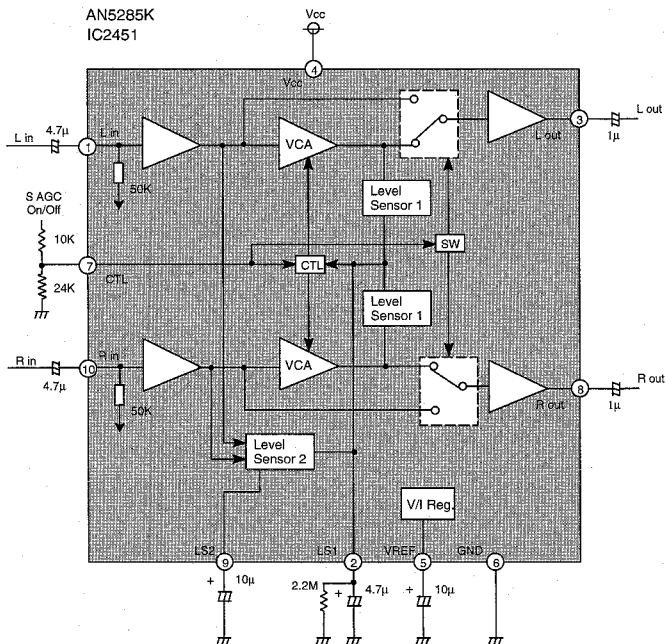


Figure 35. IC2451 - Automatic Gain Circuit

I²C Bus Line System

This Receiver makes use of one of the latest electronic technologies by using an I²C (Inter-Integrated Circuit) Bus Line Concept. Two wires, SDA (Serial Data) and SCL (Serial Clock) carry information between devices connected to the Bus. Each device connected to the Bus has a unique address for receiving data information (a Receiver) from a source (the Transmitter).

The devices are also considered to be a "Master" or a "Slave" when data is transmitted or received. In this Receiver, the "Master" (Micro Processor Unit, IC001) is the device which initiates a data transfer in the Bus line and generates the clock signal required to permit the

data to be sent. The "Slaves" (MEMORY I²C EEPROM, IC002 and VIF-SIF-VIDEO-CHROMA JUNGLE, IC101) are the devices addressed by the MPU and receive the data transmitted.

This system usually performs as a control function and replaces many of the required mechanical controls needed in a television receiver. Instead of adjusting various mechanical controls individually, many of the control functions can be performed electronically using "On Screen Menus" (the Serviceman Mode).

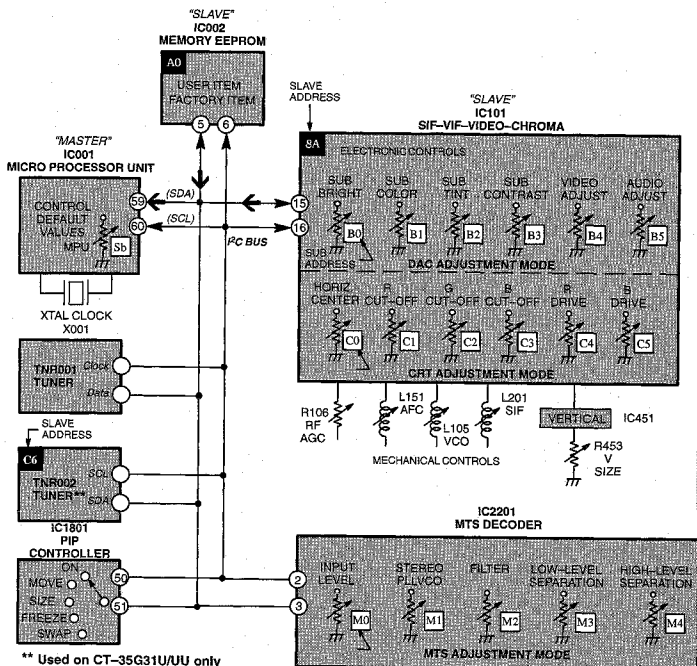


Figure 36. I²C Bus

Switching Power Supply

B+ source voltages are produced at the secondary of T801 by high frequency switching of a MOSFET transistor inside IC801. Also included in the STK730-020 package is an Amplifier, Error Detector and Over Current Protection circuit. Altogether, these circuits produce a semi regulated off line power supply circuit which require few external parts.

Operation

The switching action is done in the following way: Starter voltage from the bridge rectifier is applied to IC801 pin 4 (the Gate of MOSFET, TR1) through resistors R814 and R817. TR1 turns ON and Drain current starts to flow through the primary winding (NP) of T801. At the same time a voltage is induced at the ND1 winding which keeps a voltage on the Gate and TR1 stays ON. Drain current continues to flow and increases the voltage across the current detecting resistor R805 (IC801 pin 8). This induced voltage is integrated by the R/C time constant of IC801 internal resistor R3 and external capacitor C828 (pin 7). The voltage is applied to the Base of IC801 internal transistor TR3.

Regulation

The primary winding of T801 (NP) and the secondary windings (NS) are wired with opposite polarity. When TR1 is conducting. The current flows through winding NP. The secondary windings (NS) have no current because the B+ rectifier diodes block the flow.

The current flowing through TR1 and NP winding increases at a linear rate. When the voltage between Pins 1 and 3 of IC801 reach a fixed voltage of approximately 40.5V, TR1 turns OFF by the operation of IC801 internal error amp. This provides a state of regulation.

The secondary windings NS are wired so their voltages are in proportion to the voltage across the ND2 winding. Therefore output voltage is controlled by the error amp monitoring the voltage across ND2 winding and controls the conduction of TR1.

When TR1 turns OFF, the energy stored in T801 primary winding (NP) collapses and induces an opposite polarity voltage across the secondary windings (NS). B+ Rectifier diodes now conduct and allow current flow. When the total energy has collapsed at the primary winding, the ND2 winding also has a low voltage. The voltage across IC801 Pins 1 and 3 is now less than 40.5V and the internal error amp turns OFF to allow TR1 to conduct again. Reverse voltage polarity is again induced across the primary winding. This series of events repeats and the voltages of the secondary windings increase. When TR1 turns OFF, the energy is transferred to the secondary windings and TR1 is turned back on by the backswing. A stable oscillation begins.

Over Current/Voltage Protection

The over current/voltage protection circuit consist of IC801 internal components R3, TR3 and external components R805 (Pins 8, 9), R807, D807 (Pin7). Capacitor C828 (Pin 7) filters the base bias voltage of internal transistor TR3.

When output power increases because of a defect in a B+ source and excessive current flows, the Source current of TR1 increases. The voltage drop across R805 increases to cause oscillation frequency to decrease. Thus output voltage lowers. In other words, when the voltage drop across R805 increases, the base bias for TR3 also increases. When the bias reaches 0.6V, TR3 conducts and loads down the TR1 Gate bias to turn TR1 OFF. At the same time, the ND1 winding's current flows through R807 and D807 to produce a negative voltage and prevents TR1 from turning ON, as an over voltage protection.

The Source current of TR1 is a triangular wave shape. When output current increase, the on time of TR1 stays constant but the off time becomes longer. As a result, frequency decreases and the output power decreases for over current/voltage protection.

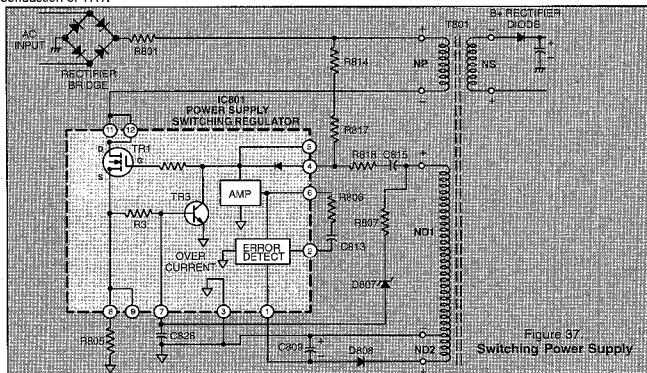


Figure 37
Switching Power Supply

Power Supply Protection

A power protection scheme is used in the NA5D chassis family. MPU (IC001) Pin 6 is a dual function Pin. The ACTION button function is activated when Pin 6 voltage is 0.44V or less. An Over Voltage Protect function is activated when Pin 6 voltage is 3.9V or higher.

With the Receiver on, the power supply B+ 16.5V is monitored and voltage divided by R047/R048. As long as the voltage at IC001 Pin 6 is 0.4V ~ 3.9V (depending on power supply operation) the Receiver operates normally.

If a major power supply switching IC failure occurs, the power supply may far exceed the normal +16.5V $\pm$ 2V specification. IC001 Pin 6 voltage will increase above 3.9V and internal circuitry of the IC will cause Pin 31 (power) to go low. When this happens, the base of Q003 is held low and it can not conduct. Relay RL001 deenergizes to open the on contact in the relay and shuts the Receiver off.

This condition will remain until AC power is momentarily disconnected.

If when pressing the power button after AC is applied again and the Receiver comes on but goes off after a few seconds, there is a problem in the Receiver's power supply.

WARNING: Because Pin 6 is a dual function Pin, do not press the "ACTION" button on the Receiver. Pressing the button when the above symptom appears will inhibit the Overvoltage Protection and if the Receiver is powered on again, severe damage may happen to the entire chassis. If IC801 is changed to correct a power supply failure, also check or change D806, D807 and D808 before reapplying power to the chassis. During a major failure, these components can fail, causing the I.C. to appear to operate normally, but it may run very hot, leading to another I.C. failure very quickly.

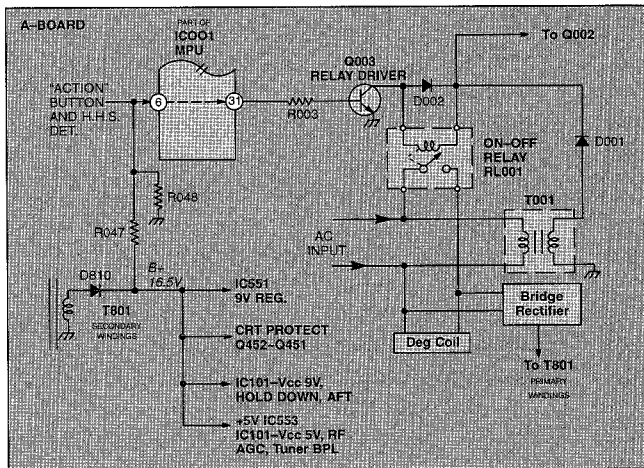


Figure 38.
Power Supply Protection

CRT Protection Circuit

The CRT Protection Circuit is made up of transistors Q452 and Q451. The circuit blanks the CRT in the event of vertical sweep loss.

During normal operation, Q452 monitors vertical sweep by being connected to the low side of the vertical yoke. When Q452 is off, C458 starts to charge from the 16V source through resistors R464 and R471. The RC time constant is such that the charging is slow. When Q452 is conducting, C458 discharges through R471 and the transistor to ground. The RC time constant is such that the discharge is fast. The slow charging and fast discharging along with voltage divider R470/R460 prevents sufficient bias for transistor Q451 to conduct. With Q451 not conducting, Pin 1 of IC101 is high and the ABL functions normally.

If yoke current ceases (due to an open yoke or no voltage at IC451 Pin 11), there is no base bias for transistor Q452. The transistor is now non conductive. Capacitor C458 is now allowed to charge a longer time to supply enough bias through the voltage divider R470/R460 for Q451 to conduct. When it does, the voltage at Pin 1 of IC101 goes low and cuts off the CRT beam current.

Diode D452 is added to the collector of Q452 to prevent the circuit from operation when Pin 3 of IC101 is grounded for the Service Switch function when setting the CRT cutoff.

It is important for the CRT life that this circuit be checked before returning a repaired Receiver to a customer. A quick test is to short Q452 base to ground. The CRT should blank. If not, troubleshoot the circuit for cause.

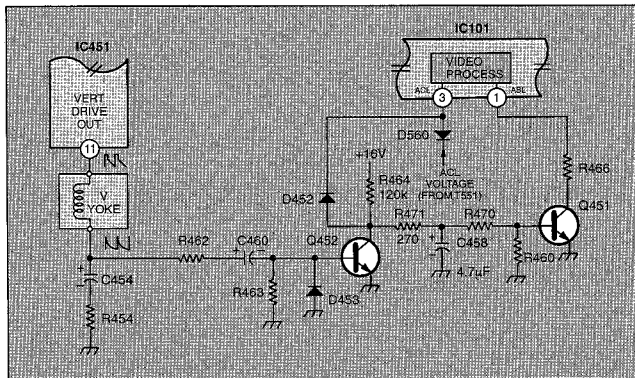


Figure 39. CRT Protect Circuit

Horizontal Hold Down Circuit

This circuit protects against excessive high voltage and CRT beam current. If for any reason the high voltage and/or CRT beam current exceeds a predetermined level, the Hold Down Circuit operates to increase the horizontal frequency. If the level increases further, the Hold Down Circuit will blank the CRT.

The CRT heater voltage from pin 6 of the flyback transformer (FBT) T551 is rectified by diode D531. This voltage is directly proportional to the high voltage variations. The voltage is filtered and divided by the precision resistors R532/R533 to approximately 2.4V and applied to Pin 49 (Hold Down) of IC101. With this voltage as the normal condition, the Hold Down Circuit is inactive and has no effect on the horizontal frequency or blanking the CRT.

The Hold Down Circuit inside IC101 is a (NPN) differential amp. One base of the differential amp is connected to Pin 49 (approximately 2.4V). The other base is connected to Pin 51 through an internal voltage divider of equal resistance. Pin 51 is clamped at a 6V DC reference voltage by the zener diode, D532. The voltage at the base of the differential amp is 3V. (1/2 of the reference voltage, 6V)

Basically, the Hold Down Circuit compares the voltage at Pin 49 (approximately 2.4V) to half of Pin 51 (clamped 6V). If the CRT heater pulse amplitude from T551 (representative of high voltage) increases, the positive voltage at the cathode of D531 and at Pin 49 of IC101 also increases.

When the increased DC voltage at Pin 49 exceeds half of Pin 51 reference voltage by a predetermined amount, the

Hold Down Circuit (differential amp.) changes conduction state and shifts the horizontal count down for a higher sweep frequency (out of sync condition) to prevent unsafe operation. For further safety, when Pin 49 voltage is extremely excessive, another internal differential amp changes state to blank the CRT.

An increase in the CRT beam current produces more negative ABL voltage at Pin 3 of T551 (FBT) which is coupled to Pin 51 of IC101 via resistor R534. This increased negative voltage opposes the positive voltage at Pin 51 and lowers the DC reference voltage to less than 6V. This in turn causes the Hold Down Circuit to operate sooner when Pin 49 voltage increases.

Thus, excessive levels of high voltage and/or increased CRT beam current cause determining of the horizontal oscillator frequency and eventual blanking of the CRT to assure operation within safe limits.

The B+ circuit and the Hold Down Circuit are not adjustable. If components in the designated areas of the schematic for critical parts are changed, operation of the Hold Down Circuit must be checked to insure that high voltage and CRT beam current does not exceed safe operation parameters. Check the following for possible failure:

1. Measure the DC voltage at Pin 49 of IC101 (reading should be close to +2.4V). If not, check D531, R531, C531, R532, R533 and IC101.
2. Measure the DC voltage at Pin 51 of IC101 (reading should be +6V). If not, check R534, C532, R539, D532, R538 and IC101.

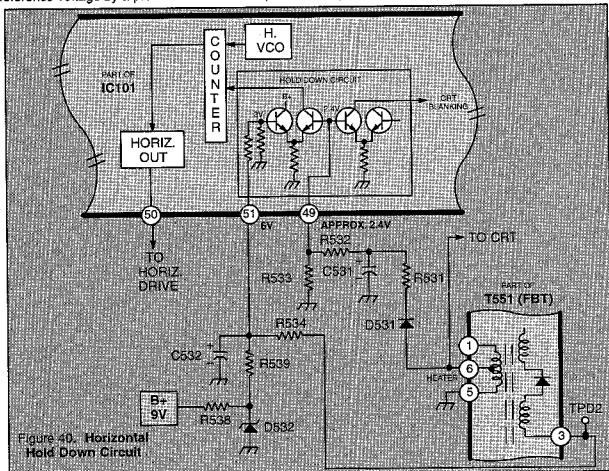
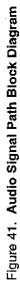


Figure 40. Horizontal Hold Down Circuit



Audio Signal Path Block Diagram CT-32S20U & CT-35G21U/UU/CU

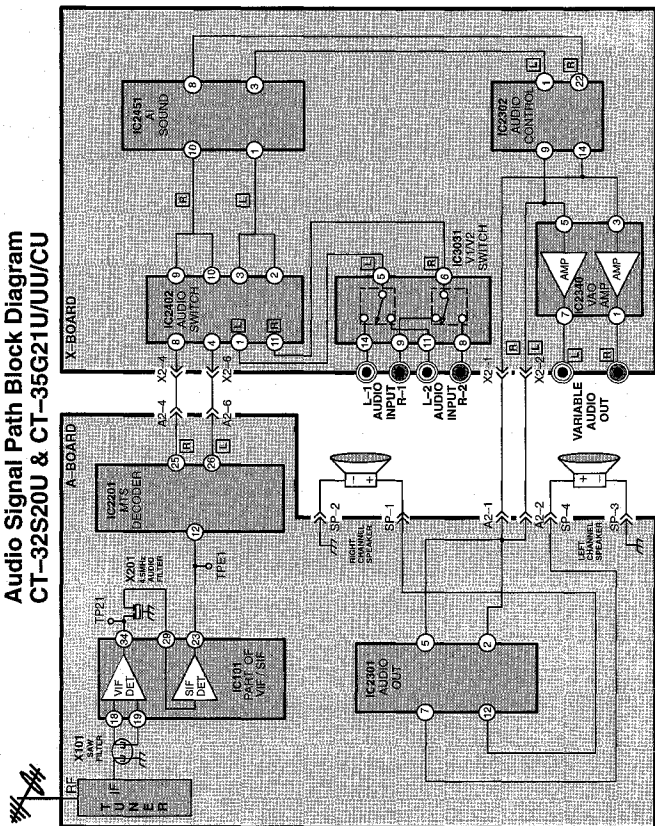


Figure 42. Audio Signal Path Block Diagram

CIRCUITS &
BLOCK DIAGRAMS

Video–Chroma Signal Path Block Diagram

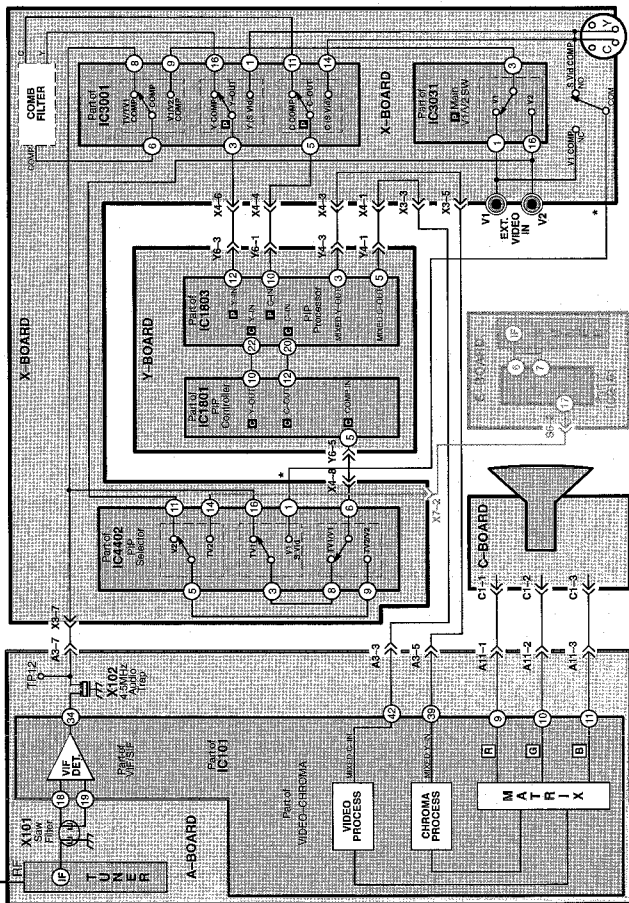


Figure 43. Chroma Signal Path Block Diagram

*** Trace is on X-Board**

Notes

IC001 MPU IN/OUT Pins and Functions MN1873265T6E & MN1873265T6F

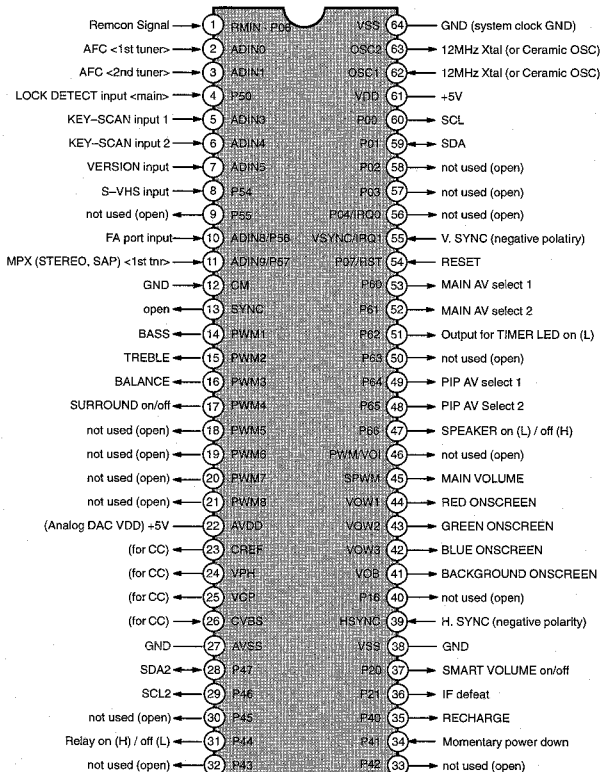


Figure 44. Microprocessor IC

IC101 Block Diagram

INPUT PINS = ◁ ▷ OUTPUT PINS = ◀ ▶

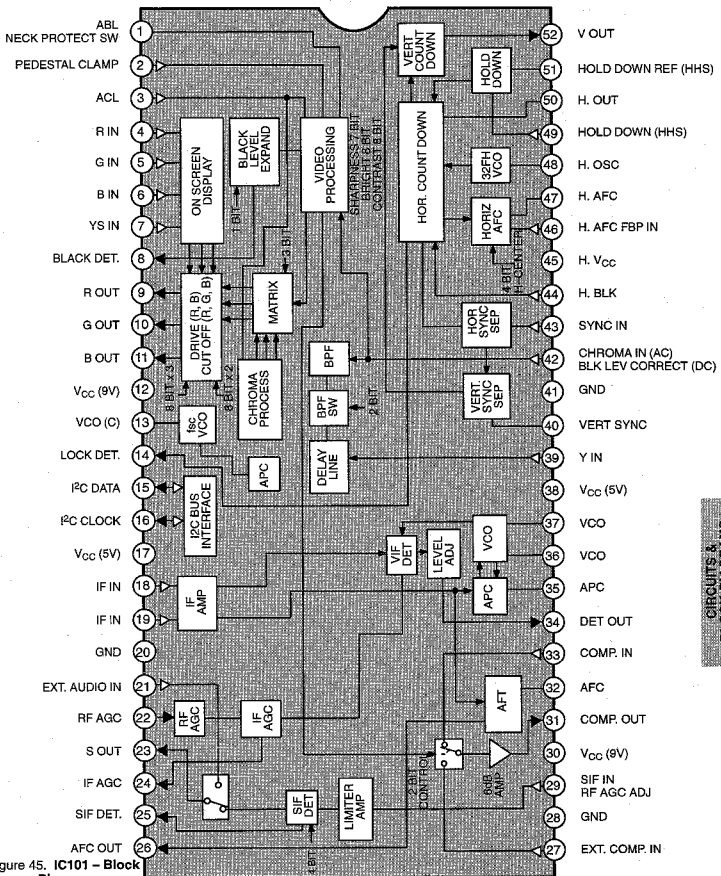


Figure 45. IC101 - Block Diagram

CIRCUITS & BLOCK DIAGRAMS

REPLACEMENT PARTS LIST

(Models: CT-32S20U, CT-35G21U/UU/CU, and CT-35G31U/UU)

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
CRA802	EXNG131P365	CAPRISTORS	C202	TACCX103T50V	CAP.C.01UF/50V
CRA803	EXNG131P365	RES-CAP 130PF/3.6 MEG	C203	TACCX103T50V	CAP.C.01UF/50V
		CAPACITORS	C301	ECEA1CN100U	CAP.E10UF-16V
C002	TACCX103T50V	CAP.C.01UF/50V	C302	ECA1CM331	CAP.E330UF/16V
C004	ECA1HM010	CAP.E1.0UF/50V	C303	ECA1CM22U	CAP.E22UF/16V
C006	TACCW101T50V	CAP.C.100PF/50V	C304	ECA1HM010	CAP.E1.0UF/50V
C007	TACCW101T50V	CAP.C.100PF/50V			CT-35G21U CT-35G21UU
C008	TACCX103T50V	CAP.C.01UF/50V			CT-35G21CUCT-35G31U
C009	ECA0JM101	CAP.E100UF/6.3V			CT-35G31UU
C010	TACCX103T50V	CAP.C.01UF/50V	C304	ECA1HM4R7	CAP.E4.7UF/50V
C013	ECA0JM101	CAP.E100UF/6.3V			CT-32S20U
C014	TACCW221T50V	CAP.C.220PF/50V	C305	ECA1HMR33	CAP.E.33UF/50V
C017	TACCCQ330T50V	CAP.C.33PF/50V	C306	ECA1HM4R7	CAP.E4.7UF/50V
C018	TACCCQ330T50V	CAP.C.33PF/50V	C308	ECQB1H223JF	CAP.P.022UF-J-50V
C019	ECA0JM101	CAP.E100UF/6.3V	C309	ECEA1HN010U	CAP.E1UF-50V
C020	ECA0JM471	CAP.E470UF/6.3V	C310	ECA1CM100	CAP.E10UF/16V
C021	TACCV561T50V	CAP.C.560PF/50V	C311	ECQB1H473JF	CAP.P.047UF-J-50V
C022	ECA1CM471	CAP.E470UF/16V	C312	ECA1CM22U	CAP.E22UF/16V
C023	TACCX103T50V	CAP.C.01UF/50V	C313	TACCV390T50V	CAP.C.39PF/50V
C024	ECA1HM4R7	CAP.E4.7UF/50V	C315	TACCW151T50V	CAP.C.150PF/50V
C026	ECA1CM102	CAP.E1000UF/16V			CT-32S20U
C032	TACCX103T50V	CAP.C.01UF/50V	C316	TACCW181T50V	CAP.C.180PF/50V
C036	ECKF1H103ZF	CAP.C.01UF-Z-50V	C351	ECKD3D102KB	CAP.C.001UF-K-2KV
		CT-35G21U CT-35G21UU			CT-35G21U CT-35G21UU
		CT-35G21CUCT-35G31U			CT-35G21CUCT-35G31U
		CT-35G31UU			CT-35G31UU
C036	TACCW222T50V	CAP.C.2200PF/50V	C351	TACCW561T50V	CAP.C.560PF/50V
C037	ECEA1CFS470	CAP.E47UF/16V			CT-32S20U
		CT-35G21U CT-35G21UU	C352	ECEA1HN010U	CAP.E1UF-50V
		CT-35G21CUCT-35G31U			CT-35G21U CT-35G21UU
		CT-35G31UU			CT-35G21CUCT-35G31U
C040	ECA1CM470	CAP.E47UF/16V			CT-35G31UU
		CT-35G21U CT-35G21UU	C352	TACCW561T50V	CAP.C.560PF/50V
		CT-35G21CUCT-35G31U			CT-32S20U
		CT-35G31UU	C353	TACCW681T50V	CAP.C.680PF/50V
C043	TACCW101T50V	CAP.C.100PF/50V			CT-32S20U
C044	TACCW101T50V	CAP.C.100PF/50V	C353	TACCW821T50V	CAP.C.820PF/50V
C057	TACCW101T50V	CAP.C.100PF/50V			CT-35G21U CT-35G21UU
C058	TACCW101T50V	CAP.C.100PF/50V			CT-35G21CUCT-35G31U
C059	TACCW101T50V	CAP.C.100PF/50V			CT-35G31UU
C102	ECA1CM100	CAP.E10UF/16V	C354	TACCW821T50V	CAP.C.820PF/50V
C104	ECA1HMR22	CAP.E.22UF/50V			CT-35G21U CT-35G21UU
C105	TACCCQ270T50V	CAP.C.27PF/50V			CT-35G21CUCT-35G31U
C106	TACCW122T50V	CAP.C.1200PF/50V			CT-35G31UU
C107	ECA1HMR47	CAP.E.47UF/50V	C355	ECKD3D102KB	CAP.C.001UF-K-2KV
C109	ECA0JM471	CAP.E470UF/6.3V			CT-32S20U
C110	TACCX103T50V	CAP.C.01UF/50V	C355	TACCW561T50V	CAP.C.560PF/50V
C111	TACCR010T50V	CAP.C.10PF/50V			CT-35G21U CT-35G21UU
C115	TACCX103T50V	CAP.C.01UF/50V			CT-35G21CUCT-35G31U
C117	TACCV470T50V	CAP.C.47PF/50V			CT-35G31UU
C126	ECA1CM331	CAP.E330UF/16V	C356	ECA1CM100	CAP.E10UF/16V
C151	ECA1HMR22	CAP.E.22UF/50V			CT-35G21U CT-35G21UU
C152	TACCCQ680T50V	CAP.C.68PF/50V			CT-35G21CUCT-35G31U
C153	TACCCQ150T50V	CAP.C.15PF/50V			CT-35G31UU
C201	ECCF1H680JP	CAP.C.68PF-J-50V	C357	ECKD2H821KB	CAP.C.820PF-K-500V
					CT-35G21U CT-35G21UU

REPLACEMENT PARTS LIST

(Models: CT-32S20U, CT-35G21U/UU/CU, and CT-35G31U/UU)

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
C357	TACCX103T50V	CT-35G21CUCT-35G31U	C507	TACCW221T50V	CAP,C 220PF/50V
		CT-35G31UU	C509	ECOF1H221JU	CAP,C 220PF-J-50V
		CAP,C .01UF/50V	C510	ECCD2H100D	CAP,C 10PF-D-500V
C364	ECA1CM100	CT-32S20U	C511	ECKD3A821KB	CAP,C 820PF-K-1KVDC
		CAP,E 10UF/16V	C512	ECEA160V33Z	CAP,E 33UF/160V
		CT-35G21U CT-35G21UU	C515	ECKD3A101KB	CAP,C 100PF-K-1KV
C365	TACCW102T50V	CT-35G21CUCT-35G31U	C517	TACCX103T50V	CAP,C .01UF/50V
		CT-35G31UU	C531	ECA1EM330	CAP,E 33UF/25V
		CAP,C .001UF/50V	C532	ECA1CM220	CAP,E 22UF/16V
C366	ECKD2H332KB	CT-35G21U CT-35G21UU	C552	TACCX103T50V	CAP,C .01UF/50V
		CT-35G21CUCT-35G31U	C555	ECEA2E2U220	CAP,E 22UF/250V
		CT-35G31UU	C558	ECA1CM471	CAP,E 470UF/16V
C370	ECKD2H821KB	CAP,C .0033UF-K-500V	C559	ECA2AM220	CAP,E 22UF/100V
		CT-35G21U CT-35G21UU	C560	ECEA1HN2R2U	CAP,E 2.2UF/50V
		CT-35G21CUCT-35G31U	C563	TAC4R6B133JC	CAP,P .013UF/1200V
C371	ECA1CM100	CT-35G31UU	C564	TAC4S6B332JC	CAP,P 3300PF/1200V
		CAP,C 820PF-K-500V	C565	ECKD3D221JB	CAP,C 220PF-J-2KV
		CT-35G21U CT-35G21UU			CT-35G21U CT-35G21UU
C373	TACCC470T50V	CT-35G21CUCT-35G31U			CT-35G21CUCT-35G31U
		CT-35G31UU			CT-35G31UU
		CAP,E 10UF/16V	C566	ECKD3D181JB	CAP,C 180PF-J-2KV
C374	TACCV470T50V	CT-35G21U CT-35G21UU	C568	ECQM4473JZ	CAP,P .047UF-J-400V
		CT-35G21CUCT-35G31U	C569	ECQF2H434JS	CAP,P .43UF-J-200V
		CT-35G31UU			CT-32S20U
C375	TACCC470T50V	CAP,C 47PF-J-50V	C569	ECQF2H564JS	CAP,P .56UF-J-200V
		CT-35G21U CT-35G21UU			CT-35G21U CT-35G21UU
		CT-35G21CUCT-35G31U			CT-35G21CU CT-35G31U
C401	ECA1HMR33	CT-35G31UU			CT-35G31UU
		CAP,C 47PF/50V	C571	ECQM4562JZ	CAP,P 5600UF-J-400V
		CAP,C 330PF/50V	C572	ECEA1EGE100	CAP,E 10UF/25V
C402	TACCV331T50V		C573	ECA1EM100	CAP,E 10UF/25V
C403	ECEA1HNR47U	CAP,E .47UF-50V	C574	ECKD2H561KB	CAP,C 560PF-K-500V
C451	ECEA1CGE221	CAP,E 220UF/16V	C575	ECAOJM222	CAP,E 2200UF/6.3V
C452	ECSF1EE105	CAP,T 1.0UF/25V	C601	TACCV101T50V	CAP,C 100PF/50V
C453	ECEA1HFS2R2	CAP,E 2.2UF/50V	C602	ECOF1H150JU	CAP,C 15PF-J-50V
C454	ECEA1EGE102	CAP,E 1000UF/25V	C607	TACCV101T50V	CAP,C 100PF/50V
C455	ECEA1VGE101	CAP,E 100UF/35V	C754	ECQB1H104KF	CAP,P 1UF-K-50V
C456	ECQV1H224JM	CAP,P 22UF-J-50V	C755	ECQB1H104KF	CAP,P 1UF-K-50V
C457	ECEA1HFS100	CAP,E 10UF-50V	C756	ECAOJM221	CAP,E 220UF-6.3V
C458	ECA1HM4R7	CAP,E 4.7UF/50V	C757	ECA1VM102	CAP,E 1000UF/35V
C460	ECEA1HGE010	CAP,E 1UF/50V	C759	ECQE1395KN	CAP,P 3.9UF-K-100V
C461	ECQM1104JZ	CAP,P 1UF-J-100V	C801	ECKDAE472ZE	CAP,C 4700PF-Z-250V
C462	ECEA1VGE471	CAP,E 470UF/35V	C802	ECKDAE472ZE	CAP,C 4700PF-Z-250V
C501	TACCVW821T50V	CAP,C 820PF/50V	C803	ECKD2H472PU	CAP,C .0047UF-P-500V
C502	ECA1HM2R2	CAP,E 2.2UF/50V	C804	ECKDAE472ZE	CAP,C 4700PF-Z-250V
C503	ECQB1H153JF	CAP,P .015UF-J-50V	C805	ECOS2DA471B4	CAP,E 470UF/160V
C504	ECQB1H1033JF	CAP,P .01UF-J-50V	C806	ECQU2A153MN	CAP,P .015UF-M-250VAC
C505	ECQB1H223JF	CAP,P .022UF-J-50V	C807	ECQU2A153MN	CAP,P .015UF-M-250VAC
C506	ECA1CM221	CAP,E 220UF/16V	C809	ECEA1JFS220	CAP,E 22UF/63V
			C810	ECQM2473KZ	CAP,P .047UF-K-200V
			C811	ECKD3A102KB	CAP,C .001UF-K-1KV
			C812	ECKD3A102KB	CAP,C .001UF-K-1KV
			C813	ECKD2H152KB	CAP,C .0015UF-K-500V
			C814	ECQU2A224MN	CAP,P 22UF-M-250VAC
			C815	ECQB1H273JF	CAP,P .027UF-J-50V
			C816	ECKD3A152KB	CAP,C .0015UF-K-1KV

REPLACEMENT PARTS LIST

(Models: CT-32S20U, CT-35G21U/UU/UCU, and CT-35G31U/UU)

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
C817	ECKD3A102KB	CAP.C.001UF-K-1KV	C2118	ECUX1H270JCX	CT-35G31U CT-35G31UU CAP.C.27PF-J-50V
C818	EC0S2D221B4	CAP.E.220UF/200V			CT-35G31U CT-35G31UU
C819	ECKD2H391KB	CAP.C.390PF-K-500V	C2119	ECUX1H103ZFX	CAP.C.01UF-Z-50V CT-35G31U CT-35G31UU
C821	ECKD3A102KB	CAP.C.001UF-K-1KV	C2120	ECEA1HFSR47	CAP.E.47UF/50V CT-35G31U CT-35G31UU
C822	ECEA1EGE102	CAP.E.1000UF/25V	C2121	ECUX1H103ZFX	CAP.C.01UF-Z-50V CT-35G31U CT-35G31UU
C823	ECKD3A561KB	CAP.C.560PF-K-1KV	C2123	ECUX1H270JCX	CAP.C.27PF-J-50V CT-35G31U CT-35G31UU
C824	ECEA1EGE222	CAP.E.2200UF/25V	C2124	ECUX1H103ZFX	CAP.C.01UF-Z-50V CT-35G31U CT-35G31UU
C828	ECQB1H473JF	CAP.P.047UF-J-50V	C2125	ECA1CM100	CAP.E.10UF/16V CT-35G31U CT-35G31UU
C829	ECKD2H331KB	CAP.C.330PF-K-500V	C2126	ECA1HMR22	CAP.E.22UF/50V CT-35G31U CT-35G31UU
C831	ECA1VM102	CAP.E.1000UF/35V	C2201	AP35K016CAE	CAP.T.3.3UF/16V
C968	TACCCX103T50V	CAP.C.01UF/50V	C2202	ECEA1HGE4R7	CAP.E.4.7UF-50V
		CT-35G21U CT-35G21UU	C2203	ECA1HM010	CAP.E.1.0UF/50V
		CT-35G21CUCT-35G31U	C2204	ECA1HM4R7	CAP.E.4.7UF/50V
		CT-35G31UU	C2205	ECEA1HGE4R7	CAP.E.4.7UF-50V
C969	ECA1CM100	CAP.E.10UF/16V	C2206	ECEA1HGE4R7	CAP.E.4.7UF-50V
		CT-35G21U CT-35G21UU	C2207	ECA1HMR47	CAP.E.4.7UF/50V
		CT-35G21CUCT-35G31U	C2208	ECA1HM4R7	CAP.E.4.7UF/50V
		CT-35G31UU	C2209	ECA1CM101	CAP.E.100UF/16V
C1021	ECEA1AFS470	CAP.E.47UF/10V	C2210	ECA1HMR33	CAP.E.33UF/50V
		CT-32S20U	C2211	ECQB1H104JF	CAP.P.1UF-J-50V
C1022	ECKF1H103ZF	CAP.C.01UF-Z-50V	C2212	ECQB1H104JF	CAP.P.1UF-J-50V
		CT-32S20U	C2213	ECQB1H104JF	CAP.P.1UF-J-50V
C1051	TACCCW101T50V	CAP.C.100PF/50V	C2214	ECQB1H104JF	CAP.P.1UF-J-50V
C1801	ECEA1HKA010	CAP.E.1.0UF/50V	C2215	ECQB1H223JF	CAP.P.022UF-J-50V
C1802	ECUX1H103ZFX	CAP.C.01UF-Z-50V	C2216	TACCCW332T50V	CAP.C.0033UF/50V
C1803	ECEA1HKA010	CAP.E.1.0UF/50V	C2219	AP106K016CAE	CAP.T.10UF/16V
C1805	ECUX1H103ZFX	CAP.C.01UF-Z-50V	C2301	ECA1EM102	CAP.E.1000UF/25V
C1806	ECEA1CKA100	CAP.E.10UF/16V	C2302	ECA1HM010	CAP.E.1.0UF/50V
C1807	ECUX1H103ZFX	CAP.C.01UF-Z-50V	C2303	TACCCW392T50V	CAP.C.3900PF/50V
C1808	ECUX1H103ZFX	CAP.C.01UF-Z-50V	C2304	TACCCW392T50V	CAP.C.3900PF/50V
C1809	ECUX1H103ZFX	CAP.C.01UF-Z-50V	C2305	ECA1HM010	CAP.E.1.0UF/50V
C1810	ECUX1H103ZFX	CAP.C.01UF-Z-50V	C2306	ECA1CM102	CAP.E.1000UF/16V
C1811	ECEA1EKA4R7	CAP.E.4.7UF/25V	C2307	ECA1CM102	CAP.E.1000UF/16V
C1812	ECUX1H103ZFX	CAP.C.01UF-Z-50V	C2308	ECEA1EN470U	CAP.E.47UF/25V
C1813	ECEA0JKA331Q	CAP.E.330UF/6.3V	C2309	ECQB1H104JF	CAP.P.1UF-J-50V
C1814	ECUX1H103ZFX	CAP.C.01UF-Z-50V	C2310	ECEA1CN100U	CAP.E.10UF-16V
C1820	ECUX1H390JCX	CAP.C.390PF-J-50V	C2311	ECEA1EN470U	CAP.E.47UF/25V
C1837	ECUX1H103ZFX	CAP.C.01UF-Z-50V	C2312	ECA1EM101	CAP.E.100UF/25V
C1838	ECUX1H103ZFX	CAP.C.01UF-Z-50V	C2313	ECA1EM101	CAP.E.100UF/25V
C2104	ECA1CM102	CAP.E.1000UF/16V	C2314	ECQB1H104JF	CAP.P.1UF-J-50V
		CT-35G31U CT-35G31UU	C2315	ECA1EM100	CAP.E.10UF/25V
C2105	ECA0JM101	CAP.E.100UF/6.3V	C2316	ECA1CM101	CAP.E.100UF/16V
		CT-35G31U CT-35G31UU	C2318	TACCCW332T50V	CAP.C.0033UF/50V
C2106	ECA1HMR47	CAP.E.47UF/50V	C2319	TACCCW332T50V	CAP.C.0033UF/50V
		CT-35G31U CT-35G31UU	C2320	ECA1CM222	CAP.E.2200UF-16V
C2108	ECA1CM330	CAP.E.33UF/16V	C2321	ECA1HM010	CAP.E.1.0UF/50V
		CT-35G31U CT-35G31UU	C2322	ECA1CM100	CAP.E.10UF/16V
C2109	ECUX1H103ZFX	CAP.C.01UF-Z-50V	C2323	ECUX1H103KXB	CAP.C.01UF-K-50V
C2111	ECEA1HFSR22	CAP.E.22UF/50V			
		CT-35G31U CT-35G31UU			
C2114	ECUX1H103ZFX	CAP.C.01UF-Z-50V			
		CT-35G31U CT-35G31UU			
C2115	ECA1HM100	CAP.E.10UF/50V			
		CT-35G31U CT-35G31UU			
C2116	ECUX1H103ZFX	CAP.C.01UF-Z-50V			

REPLACEMENT PARTS LIST

(Models: CT-32S20U, CT-35G21U/UU/CU, and CT-35G31U/UU)

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
C2324	EQQB1H683JF	CAPP.068UF-J-50V	C3037	ECA1CM470	CAP.E47UF/16V
C2325	ECEA1HN3R3U	CAP.E3.3UF-50V	C3071	ECA1CM220	CAP.E22UF/16V
C2326	ECEA1HN3R3U	CAP.E3.3UF-50V	C3072	ECUX1H103KBX	CAP.C.01UF-K-50V
C2327	ECUX1H103KBX	CAP.C.01UF-K-50V	C3201	ECA1CM470	CAP.E47UF/16V
C2328	EQQB1H683JF	CAPP.068UF-J-50V	C3202	EQQB1H473JF	CAPP.047UF-J-50V
C2331	ECA1CM100	CAP.E10UF/16V	C3203	ECUX1H103KBX	CAP.C.01UF-K-50V
C2332	ECA1CM100	CAP.E10UF/16V	C3204	ECUX1H103KBX	CAP.C.01UF-K-50V
C2333	ECA1CM100	CAP.E10UF/16V	C3206	ECEA1AN220U	CAP.E22UF-10V
C2334	ECA1HM010	CAP.E1.0UF/50V	C3207	ECUX1H103ZFX	CAP.C.01UF-Z-50V
C2335	ECA1HM010	CAP.E1.0UF/50V	C3208	ECUX1H101JCX	CAP.C.100PF-J-50V
C2340	ECA1CM100	CAP.E10UF/16V	C3209	ECUX1H121JCX	CAP.C.120PF-J-50V
C2341	ECA1CM100	CAP.E10UF/16V	C3212	ECUX1H390JCX	CAP.C.39PF-J-50V
C2342	ECA1HM010	CAP.E1.0UF/50V	C4353	ECUX1H103ZFX	CAP.C.01UF-Z-50V
C2343	ECA1HM010	CAP.E1.0UF/50V	C4354	ECEA1CKA220	CAP.E22UF/16V
C2344	ECA1CM221	CAP.E220UF/16V	C4355	ECEA1CKA100	CAP.E10UF/16V
C2347	ECA1CM221	CAP.E220UF/16V	C4356	ECUX1H103ZFX	CAP.C.01UF-Z-50V
C2348	ECA1CM102	CAP.E1000UF/16V	C4357	ECUX1H103ZFX	CAP.C.01UF-Z-50V
C2403	ECA1CM470	CAP.E47UF/16V	C4358	ECA1CM470	CAP.E47UF/16V
C2404	ECA1HM010	CT-35G31U CT-35G31UU	C4359	ECUX1H103ZFX	CAP.C.01UF-Z-50V
		CAP.E1.0UF/50V	C4360	ECEA1CKA220	CAP.E22UF/16V
C2405	ECA1CM100	CT-35G31U CT-35G31UU	C4361	ECEA1HKA2R2	CAP.E2.2UF/50V
		CAP.E10UF/16V	C4362	ECUX1H103ZFX	CAP.C.01UF-Z-50V
		CT-35G31U CT-35G31UU	C4363	ECUX1H103ZFX	CAP.C.01UF-Z-50V
C2406	EQQB1H823JF	CAPP.082UF-J-50V	C4364	ECEA1HKA3R3	CAP.E3.3UF/50V
		CT-35G31U CT-35G31UU	C4365	ECEA1HKA47	CAP.E.47UF/50V
C2407	EQQB1H104JF	CAPP.1UF-J-50V	C4367	ECUX1H103ZFX	CAP.C.01UF-Z-50V
		CT-35G31U CT-35G31UU	C4368	ECUX1H681KBX	CAP.C.680PF-K-50V
C2408	ECUX1H222KBX	CAP.C.0022UF-K-50V	C4369	ECEA1HKA47	CAP.E.47UF/50V
		CT-35G31U CT-35G31UU	C4370	ECUX1H391KBX	CAP.C.390PF-K-50V
C2409	ECUX1H223KBX	CAP.C.022UF-K-50V	C4371	ECEA1HN010U	CAP.E1UF-50V
		CT-35G31U CT-35G31UU	C4374	ECUX1H122JCX	CAP.C.0012UF-J-50V
C2410	ECUX1H223KBX	CAP.C.022UF-K-50V	C4375	ECEA1HKA010	CAP.E1.0UF/50V
		CT-35G31U CT-35G31UU	C4380	ECRHA030E81	TRIMMER:30PF
C2451	ECA1CM100	CAP.E10UF/16V	C4390	ECA0JM331	CAP.E330UF/6.3V
C2452	ECA1CM100	CAP.E10UF/16V	C4407	ECUX1H103ZFX	CAP.C.01UF-Z-50V
C2453	ECA1HM4R7	CAP.E4.7UF/50V	C4408	ECUX1H101JCX	CAP.C.100PF-J-50V
C2455	ECEA1HN010U	CAP.E1UF-50V	C4411	ECA1CM100	CAP.E10UF/16V
		CT-35G31U CT-35G31UU	C4412	ECEA1CN100U	CAP.E10UF-16V
C2456	ECEA1HN010U	CAP.E1UF-50V	C4414	ECEA1CN100U	CAP.E10UF-16V
		CT-35G31U CT-35G31UU	C4415	ECA1CM100	CAP.E10UF/16V
C2457	ECA1HM4R7	CAP.E4.7UF/50V	C4416	ECA1CM100	CAP.E10UF/16V
C2458	ECA1HM4R7	CAP.E4.7UF/50V	C4420	ECUX1H820JCX	CAP.C.82PF-J-50V
C3001	ECA1HM010	CAP.E1.0UF/50V			DIODES
C3002	ECA1HM010	CAP.E1.0UF/50V	D001	ERA15-01	DIODE
C3003	ECA1CM100	CAP.E10UF/16V	D002	MA167	DIODE
C3004	ECA1CM220	CAP.E22UF/16V	D003	MTZJT-774.7B	DIODE, ZENER
C3005	ECA1CM220	CAP.E22UF/16V	D004	MTZJT-776.2C	DIODE, ZENER
C3006	ECA1CM470	CAP.E47UF/16V	D005	MA165	DIODE
C3007	ECUX1H103KBX	CAP.C.01UF-K-50V	D006	MA165	DIODE
C3008	ECUX1H151JCX	CAP.C.150PF-J-50V	D007	MA165	DIODE
C3031	ECA1CM100	CAP.E10UF/16V	D024	MTZJT-7736B	DIODE, ZENER
C3032	ECA1CM100	CAP.E10UF/16V	D026	MTZJT-776.2A	DIODE, ZENER
C3033	ECUX1H103ZFX	CAP.C.01UF-Z-50V	D352	MTZJT-776.2A	DIODE, ZENER
C3034	ECA1HM010	CAP.E1.0UF/50V			CT-32S20U
C3035	ECA1HM010	CAP.E1.0UF/50V	D353	MTZJT-776.2A	DIODE, ZENER
C3036	ECUX1H103ZFX	CAP.C.01UF-Z-50V			CT-32S20U

PARTS LIST

REPLACEMENT PARTS LIST

(Models: CT-32S20U, CT-35G21U/UU/CU, and CT-35G31U/UU)

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REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
D355	MTZJT-776.2A	DIODE, ZENER	D3079	MA3110M	DIODE, ZENER
		CT-32S20U	D3080	MA3110M	DIODE, ZENER
D366	MA165	DIODE	D3081	MA3110M	DIODE, ZENER
		CT-35G21U CT-35G21UU	D3082	MA3110M	DIODE, ZENER
		CT-35G21CU CT-35G31U	D3083	MA3110M	DIODE, ZENER
		CT-35G31UU			CT-35G31U CT-35G31UU
D367	MTZJT-775.6B	DIODE, ZENER	D3084	MA3110M	DIODE, ZENER
		CT-35G21U CT-35G21UU			CT-35G31U CT-35G31UU
		CT-35G21CU CT-35G31U			FUSES
		CT-35G31UU	F801	0BA1C40NU100	FUSE 4.0A/125V
D368	MTZJT-775.6B	DIODE, ZENER			INTEGRATED CIRCUITS
		CT-35G21U CT-35G21UU	IC001	MN1873265T6E	INT CKT
		CT-35G21CU CT-35G31U			CT-35G31U CT-35G31UU
		CT-35G31UU	IC001	MN1873265T6F	INT CKT
D451	ERA15-01	DIODE			CT-32S20U CT-35G21U
D452	MA165	DIODE			CT-35G21UU CT-35G21CU
D453	MA165	DIODE	IC002	24LC02BIP	INT CKT
D454	MA4120M	DIODE	IC101	AN5163K	INT CKT
D455	MTZJT-7712A	DIODE, ZENER	IC451	LA7836-TV	INT CKT
D456	MA165	DIODE	IC551	AN78M09	PLUS 9V AVR
D501	MTZJT-778.2B	DIODE, ZENER			CT-32S20U CT-35G21U
D531	AS01	DIODE			CT-35G21UU CT-35G21CU
D532	MTZMT-776.2A	DIODE, ZENER	IC551	AN7809	INT CKT
D554	AS01	DIODE			CT-35G31U CT-35G31UU
D555	MA165	DIODE			INT CKT
D556	MTZJT-7739D	DIODE, ZENER	IC552	AN78L12	INT CKT
D558	RS3FS	DIODE	IC553	AN78M05	PLUS 5V AVR
D559	TVSRU3MV1	DIODE, RECTIFIER	IC801	STK730-020	INT CKT
D560	MA165	DIODE	IC1801	M65607SP	INT CKT
		CT-32S20U	IC1802	M4C264AL-12	INT CKT
D563	MA165	DIODE	IC1803	M52694P	INT CKT
D801	TVSRM11B	DIODE	IC1804	MN1280R	INT CKT
D802	TVSRM11B	DIODE	IC2101	AN5170K	INT CKT
D803	TVSRM11B	DIODE			CT-35G31U CT-35G31UU
D804	TVSRM11B	DIODE	IC2201	AN5818NK	INT CKT
D805	TRPW5B0M0300	THERMISTOR	IC2301	AN7147N	INT CKT
D806	TVSRU1CV	DIODE, RECTIFIER	IC2302	CXA1279AS	INT CKT
D807	MTZJT-777.5B	DIODE, ZENER	IC2340	BA15218N	INT CKT
D808	AU01	DIODE	IC2401	UPC1891ACY	INT CKT
D809	RU30ALFS1	DIODE, RECTIFIER			CT-35G31U CT-35G31UU
D810	RU3YX-MLF-C2	DIODE	IC2402	MC14066BCP	INT CKT
D811	RU3YX-MLF-C2	DIODE	IC2451	AN5285K	INT CKT
D812	AU02	DIODE	IC3001	M52055P	INT CKT
D1801	MA151K	DIODE	IC3031	M52055P	INT CKT
D2101	MA3330M	DIODE	IC4402	M52055P	INT CKT
		CT-35G31U CT-35G31UU			COILS
D3001	MA151K	DIODE	DEG	OLK19049A	COIL, DEGAUSSING 35"
D3002	MA151K	DIODE			CT-35G21U CT-35G21UU
D3071	MA3110M	DIODE, ZENER			CT-35G21CU CT-35G31U
D3072	MA3110M	DIODE, ZENER			CT-35G31UU
D3073	MA3110M	DIODE, ZENER	DEG	OLK19050	COIL, DEGAUSSING
D3074	MA3110M	DIODE, ZENER			CT-32S20U
D3075	MA3110M	DIODE, ZENER	DY	TLYA007	YOKE, DEFLECTION
D3076	MA3110M	DIODE, ZENER			CT-32S20U
D3077	MA3110M	DIODE, ZENER	DY	KDY42H552F	YOKE, DEFLECTION
D3078	MA3110M	DIODE, ZENER			CT-35G21U CT-35G21UU
					CT-35G21CU CT-35G31U

REPLACEMENT PARTS LIST

(Models: CT-32S20U, CT-35G21U/UU/CU, and CT-35G31U/UU)

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REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
L001	EXCELSA24	CT-35G31UU FERRITE BEAD	L815	0SC9002	FERRITE BEAD
L003	TLUABTA4R7K	COIL, PEAKING 4.7UH	L816	0SC9002	FERRITE BEAD
L004	TLUABTA4R7K	COIL, PEAKING 4.7UH	L818	EXCELSA35	FERRITE BEAD
L005	TLUABTA100K	COIL, PEAKING 10UH	L819	EXCELSA35	FERRITE BEAD
L008	TLUABTA120K	COIL, PEAKING 12UH	L958	EXCELSA35	FERRITE BEAD
L009	EXCELSA35	FERRITE BEAD			CT-35G21U CT-35G21UU
L012	TLUABTA1R0K	COIL, PEAKING 1.0UH			CT-35G21CU CT-35G31U
L013	EXCELSA24	FERRITE BEAD			CT-35G31UU
L014	EXCELSA24	CT-35G31U CT-35G31UU	L1051	TLUABTA151K	COIL, PEAKING 150UH
L021	TLUABTA390K	COIL, PEAKING 39UH	L1802	TLTACT100K	COIL, PEAKING 10UH
L101	TLTACT150K	COIL, PEAKING 15UH	L2101	TLTACT120K	COIL, PEAKING 12UH
L102	TLQ015J205C	COIL, PEAKING 2H			CT-35G31U CT-35G31UU
L103	TLQ015J205C	COIL, PEAKING 2H	L2103	TLTACT150K	COIL, PEAKING 15UH
L105	EIV7EN053B	VCO			CT-35G31U CT-35G31UU
L108	TLUABTA1R0K	COIL, PEAKING 1.0UH	L2105	TLTACT1R2K	COIL, PEAKING 1.2UH
L109	TLUABTA1R0K	COIL, PEAKING 1.0UH			CT-35G31U CT-35G31UU
L151	EIV7EN041B	COIL, AFT	L2106	TLTACT560K	COIL, PEAKING 56UH
L201	EQS7EN053B	COIL, QUADRATURE			CT-35G31U CT-35G31UU
L351	EXCELSA35	FERRITE BEAD	L2107	TLTACT1R2K	COIL, PEAKING 1.2UH
		CT-35G21U CT-35G21UU			CT-35G31U CT-35G31UU
		CT-35G21CU CT-35G31U	L2109	EIV7EN053B	VCO
		CT-35G31UU			CT-35G31U CT-35G31UU
L351	TLUABTA151K	COIL, PEAKING 150UH	L3001	TLTACT100K	COIL, PEAKING 10UH
L352	EXCELSA35	CT-32S20U	L3201	EFDEN645B35B	DELAY LINE
L353	EXCELSA35	FERRITE BEAD	L3202	EIK1EG024B	CHROMA TRAP
L354	EXCELD25C	FERRITE BEAD	L3203	TLTACT180K	COIL, PEAKING 18UH
		CT-32S20U	L3204	TLTACT100K	COIL, PEAKING 10UH
		CT-32S20U	L4351	TLTACT2R2K	COIL, PEAKING 2.2UH
		CT-32S20U	L4352	TLTACT100K	COIL, PEAKING 10UH
		CT-32S20U	L4353	EXCELD25C	FERRITE BEAD
		CT-32S20U	L4402	TLTACT100K	COIL, PEAKING 10UH
L551	TLH6626P	COIL, LINEARITY			TRANSISTORS
		CT-35G21U CT-35G21UU	Q001	2SA564AQRS	TRANSISTOR
		CT-35G21CU CT-35G31U	Q002	2SC1685QRS	TRANSISTOR
		CT-35G31UU	Q003	2SC1685QRS	TRANSISTOR
L551	TLH6663P	COIL, LINEARITY	Q004	2SA564AQRS	TRANSISTOR
		CT-32S20U	Q005	2SC1685QRS	TRANSISTOR
L553	EXCELSA24	FERRITE BEAD	Q101	2SC1685QRS	TRANSISTOR
L557	0SC9002	FERRITE BEAD	Q103	2SC1685QRS	TRANSISTOR
L558	EXCELSA24	FERRITE BEAD	Q305	2SA564AQRS	TRANSISTOR
L559	EXCELSA35	FERRITE BEAD	Q306	2SC1685QRS	TRANSISTOR
L563	ELIEI330KA	COIL, 33UH	Q307	2SC1685QRS	TRANSISTOR
L571	ELIEI680KA	COIL, PEAKING 68UH	Q351	2SC3063	TRANSISTOR
L601	TLTACT100K	COIL, PEAKING 10UH	Q352	2SC3063	TRANSISTOR
L751	TLH15727	REACTOR, PINCUSHION	Q353	2SC3063	TRANSISTOR
L801	TLPD008	LINE FILTER	Q354	2SC1685QRS	TRANSISTOR
L802	ELIEI330KA	COIL, 33UH			CT-35G21U CT-35G21UU
L803	EXCELSA39	FERRITE BEAD			CT-35G21CU CT-35G31U
L804	EXCELSA39	FERRITE BEAD	Q355	2SC1685QRS	CT-35G31UU
L806	EXCELSA35	FERRITE BEAD			TRANSISTOR
L808	0SC9002	FERRITE BEAD			CT-35G21U CT-35G21UU
L810	EXCELSA24	FERRITE BEAD			CT-35G21CU CT-35G31U
L811	EXCELSA35	FERRITE BEAD			CT-35G31UU
L814	0SC9002	FERRITE BEAD	Q356	2SC1685QRS	TRANSISTOR
					CT-35G21U CT-35G21UU
					CT-35G21CU CT-35G31U

REPLACEMENT PARTS LIST

(Models: CT-32S20U, CT-35G21U/UU/CU, and CT-35G31U/UU)

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
Q363	2SA564AQRS	CT-35G31UU TRANSISTOR	R002	ERDS2TJ182	RES,C 1.8K-J-1/4
		CT-35G21U CT-35G21UU	R003	ERDS2TJ472	RES,C 4.7K-J-1/4
		CT-35G21CUCT-35G31U	R004	ERDS2TJ331	RES,C 330-J-1/4
		CT-35G31UU	R005	ERDS2TJ101	RES,C 100-J-1/4
Q451	2SC1685QRS	TRANSISTOR	R006	ERDS2TJ473	RES,C 47K-J-1/4
Q452	2SC1685QRS	TRANSISTOR	R007	ERDS2TJ222	RES,C 2.2K-J-1/4
Q501	2SC4212H	TRANSISTOR	R008	ERDS2TJ222	RES,C 2.2K-J-1/4
Q551	BU2508DF	TRANSISTOR	R009	ERDS2TJ222	RES,C 2.2K-J-1/4
Q560	2SA564AQRS	TRANSISTOR	R010	ERDS2TJ182	RES,C 1.8K-J-1/4
		CT-35G21U CT-35G21UU	R011	ERDS2TJ681	RES,C 680-J-1/4
		CT-35G21CUCT-35G31U	R012	ERDS2TJ681	RES,C 680-J-1/4
		CT-35G31UU	R013	ERDS2TJ681	RES,C 680-J-1/4
Q751	2SC1685QRS	TRANSISTOR	R015	ERDS2TJ392	RES,C 3.9K-J-1/4
Q752	2SA564AQRS	TRANSISTOR	R016	ERDS2TJ472	RES,C 4.7K-J-1/4
Q753	2SD1266	TRANSISTOR	R017	ERDS2TJ472	RES,C 4.7K-J-1/4
Q2101	MSD601R	TRANSISTOR	R018	ERDS2TJ683	RES,C 68K-J-1/4
		CT-35G31U CT-35G31UU	R019	ERDS2TJ823	RES,C 82K-J-1/4
Q2301	2SC1685QRS	TRANSISTOR	R020	ERDS2TJ474	RES,C 470K-J-1/4
Q2302	2SA564AQRS	TRANSISTOR	R021	ERDS2TJ101	RES,C 100-J-1/4
Q2401	MSD601R	TRANSISTOR	R022	ERDS2TJ101	RES,C 100-J-1/4
Q2402	MSD601R	TRANSISTOR	R023	ERDS2TJ102	RES,C 1K-J-1/4
Q3007	MSB709R	TRANSISTOR	R025	ERDS2TJ272	RES,C 2.7K-J-1/4
Q3071	MSD601R	TRANSISTOR	R026	ERDS2TJ472	RES,C 4.7K-J-1/4
Q3072	MSD601R	TRANSISTOR	R027	ERDS2TJ181	RES,C 180-J-1/4
Q3073	MSD601R	TRANSISTOR	R028	ERDS2TJ102	RES,C 1K-J-1/4
Q3201	MSD601R	TRANSISTOR			CT-35G31U CT-35G31UU
Q3202	MSD601R	TRANSISTOR	R029	ERDS2TJ102	RES,C 1K-J-1/4
Q3203	MSD601R	TRANSISTOR	R030	ERDS2CKF1002	RES,M 10K-F-1/4
Q3204	MSD601R	TRANSISTOR	R031	ERDS2TJ121	RES,C 120-J-1/4
Q3205	MSD601R	TRANSISTOR	R032	ERDS1FJ330	RES,C 33-J-1/2
Q3206	MSD601R	TRANSISTOR	R033	ERDS2TJ222	RES,C 2.2K-J-1/4
Q4351	MSB709R	TRANSISTOR			CT-32S20U
Q4354	MSB709R	TRANSISTOR	R034	ERDS2TJ222	RES,C 2.2K-J-1/4
Q4355	MSB709R	TRANSISTOR			CT-32S20U
Q4356	MSB709R	TRANSISTOR	R035	ERDS2TJ332	RES,C 3.3K-J-1/4
Q4357	MSD601R	TRANSISTOR			CT-32S20U
Q4358	MSB709R	TRANSISTOR	R036	ERDS2TJ562	RES,C 5.6K-J-1/4
Q4360	MSD601R	TRANSISTOR			CT-32S20U
Q4361	MSD601R	TRANSISTOR	R037	ERDS2TJ103	RES,C 10K-J-1/4
Q4362	MSD601R	TRANSISTOR			CT-32S20U
Q4363	MSD601R	TRANSISTOR	R038	ERDS2TJ223	RES,C 22K-J-1/4
Q4369	MSB709R	TRANSISTOR			CT-32S20U
Q4370	MSB709R	TRANSISTOR	R039	ERDS2TJ101	RES,C 100-J-1/4
Q4371	MSD601R	TRANSISTOR	R041	ERDS2TJ122	RES,C 1.2K-J-1/4
Q4401	MSB709R	TRANSISTOR	R042	ERDS2TJ391	RES,C 390-J-1/4
		RELAYS	R043	ERDS2TJ103	RES,C 10K-J-1/4
RL801	TSEH8007	RELAY	R044	ERDS2TJ334	RES,C 330K-J-1/4
		RESISTORS	R045	ERDS2TJ684	RES,C 680K-J-1/4
RM001	RPM-637CBRL	IR RECEIVER, REMOTE CONTROL	R047	ERDS2TJ223	RES,C 22K-J-1/4
		CT-35G21U CT-35G21UU	R048	ERDS2TJ302	RES,C 3K-J-1/4
		CT-35G21CUCT-35G31U	R050	ERDS2TJ153	RES,C 15K-J-1/4
		CT-35G31UU			CT-32S20U CT-35G21U
RM001	RPM-637CBRS	IR RECEIVER, REMOTE CONTROL	R051	ERDS2TJ103	RES,C 10K-J-1/4
		CT-32S20U			CT-35G31U CT-35G31UU
R001	ERDS2TJ101	RES,C 100-J-1/4	R051	ERDS2TJ273	RES,C 27K-J-1/4

REPLACEMENT PARTS LIST

(Models: CT-32S20U, CT-35G21U/UU/CU, and CT-35G31U/UU)

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
		CT-32S20U CT-35G21U	R305	ERDS2TJ102	RES,C 1K-J-1/4
		CT-35G21U/CT-35G21CU	R306	ERDS2TJ102	RES,C 1K-J-1/4
R053	ERDS2TJ102	RES,C 1K-J-1/4	R313	ERDS2TJ471	RES,C 470-J-1/4
R054	ERDS2TJ102	RES,C 1K-J-1/4	R316	ERDS2TJ682	RES,C 6.8K-J-1/4
R055	ERDS2TJ101	RES,C 100-J-1/4	R317	ERDS2TJ221	RES,C 220-J-1/4
R056	ERDS2TJ101	RES,C 100-J-1/4	R319	ERDS2TJ514	RES,C 510K-J-1/4
R057	ERDS2TJ221	RES,C 220-J-1/4	R321	ERDS2TJ471	RES,C 470-J-1/4
R058	ERDS2TJ221	RES,C 220-J-1/4	R323	ERDS2TJ101	RES,C 100-J-1/4
R059	ERDS2TJ221	RES,C 220-J-1/4	R324	ERDS2TJ331	RES,C 330-J-1/4
R060	ERDS2TJ102	RES,C 1K-J-1/4	R325	ERDS2TJ222	RES,C 2.2K-J-1/4
R066	ERDS2CKF4302	RES,M 43K-F-1/4	R326	ERDS2TJ471	RES,C 470-J-1/4
		CT-35G21U CT-35G21UU	R328	ERDS2TJ332	RES,C 3.3K-J-1/4
		CT-35G21CU/CT-35G31U	R351	ERDS2TJ271	RES,C 270-J-1/4
		CT-35G31UU			CT-35G21U CT-35G21UU
R071	ERDS2TJ101	RES,C 100-J-1/4			CT-35G21CU/CT-35G31U
R073	ERDS2TJ103	RES,C 10K-J-1/4			CT-35G31UU
R074	ERG1SJ473P	RES,M 47K-J-1W	R351	ERG2ANJP123H	RES,M 12K-J-2W
R078	ERG1SJ473P	RES,M 47K-J-1W			CT-32S20U
		CT-35G31U CT-35G31UU	R352	ERDS2TJ271	RES,C 270-J-1/4
R080	ERDS2TJ222	RES,C 2.2K-J-1/4			CT-35G21U CT-35G21UU
		CT-35G21U CT-35G21UU			CT-35G21CU/CT-35G31U
		CT-35G21CU/CT-35G31U			CT-35G31UU
		CT-35G31UU	R352	ERG2ANJP123H	RES,M 12K-J-2W
R081	ERDS2TJ222	RES,C 2.2K-J-1/4			CT-32S20U
		CT-35G21U CT-35G21UU	R353	ERDS2TJ271	RES,C 270-J-1/4
		CT-35G21CU/CT-35G31U			CT-35G21U CT-35G21UU
		CT-35G31UU			CT-35G21CU/CT-35G31U
R082	ERDS2TJ103	RES,C 10K-J-1/4			CT-35G31UU
R082	ERDS2TJ332	RES,C 3.3K-J-1/4	R353	ERG2ANJP123H	RES,M 12K-J-2W
		CT-35G21U CT-35G21UU			CT-32S20U
		CT-35G21CU/CT-35G31U	R354	ERDS1TJ272	RES,C 2.7K-J-1/2
		CT-35G31UU			CT-32S20U
R083	ERDS2TJ562	RES,C 5.6K-J-1/4	R354	ERDS2TJ101	RES,C 100-J-1/4
		CT-35G21U CT-35G21UU			CT-35G21U CT-35G21UU
		CT-35G21CU/CT-35G31U			CT-35G21CU/CT-35G31U
		CT-35G31UU			CT-35G31UU
R084	ERDS2TJ103	RES,C 10K-J-1/4	R355	ERDS1TJ272	RES,C 2.7K-J-1/2
		CT-35G21U CT-35G21UU			CT-32S20U
		CT-35G21CU/CT-35G31U	R355	ERDS2TJ101	RES,C 100-J-1/4
		CT-35G31UU			CT-35G21U CT-35G21UU
R093	ERDS2TJ102	RES,C 1K-J-1/4			CT-35G21CU/CT-35G31U
R101	ERDS2TJ683	RES,C 68K-J-1/4			CT-35G31UU
R103	ERDS2TJ183	RES,C 18K-J-1/4	R356	ERDS1TJ272	RES,C 2.7K-J-1/2
R104	ERDS2TJ121	RES,C 120-J-1/4			CT-32S20U
R105	ERDS2TJ102	RES,C 1K-J-1/4	R356	ERDS2TJ101	RES,C 100-J-1/4
R106	EVND2AA03B14	CONTROL 10K			CT-35G21U CT-35G21UU
R107	ERDS2TJ222	RES,C 2.2K-J-1/4			CT-35G21CU/CT-35G31U
R111	ERDS2TJ361	RES,C 360-J-1/4			CT-35G31UU
R112	ERDS2TJ561	RES,C 560-J-1/4	R357	ERDS2TJ101	RES,C 100-J-1/4
R113	ERDS2TJ473	RES,C 47K-J-1/4			CT-35G21U CT-35G21UU
R114	ERDS2TJ104	RES,C 100K-J-1/4			CT-35G21CU/CT-35G31U
R115	ERDS2TJ221	RES,C 220-J-1/4			CT-35G31UU
R152	ERDS2TJ154	RES,C 150K-J-1/4	R357	ERDS2TJ241	RES,C 240-J-1/4
R201	ERDS2TJ221	RES,C 220-J-1/4			CT-32S20U
R203	ERDS2TJ392	RES,C 3.9K-J-1/4	R358	ERDS2TJ101	RES,C 100-J-1/4
R304	ERDS2TJ274	RES,C 270K-J-1/4			CT-35G21U CT-35G21UU

REPLACEMENT PARTS LIST

(Models: CT-32S20U, CT-35G21U/UU/CU, and CT-35G31U/UU)

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REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
R358	ERDS2TJ241	CT-35G21CUCT-35G31U CT-35G31UU RES,C240-J-1/4 CT-32S20U	R376	ERG2SJS103H	CT-35G21CUCT-35G31U CT-35G31UU RES,M10K-J-2W CT-35G21U CT-35G21UU CT-35G21CUCT-35G31U CT-35G31UU
R359	ERDS2TJ101	RES,C100-J-1/4 CT-35G21U CT-35G21UU CT-35G21CUCT-35G31U CT-35G31UU	R389	ERDS1TJ272	RES,C27K-J-1/2 CT-35G21U CT-35G21UU CT-35G21CUCT-35G31U CT-35G31UU
R359	ERDS2TJ241	RES,C240-J-1/4 CT-32S20U	R390	ERDS1TJ272	RES,C27K-J-1/2 CT-35G21U CT-35G21UU CT-35G21CUCT-35G31U CT-35G31UU
R360	ERDS2TJ152	RES,C1.5K-J-1/4 CT-32S20U	R391	ERDS1TJ272	RES,C27K-J-1/2 CT-35G21U CT-35G21UU CT-35G21CUCT-35G31U CT-35G31UU
R361	ERDS2TJ152	RES,C1.5K-J-1/4 CT-32S20U	R392	ERDS1TJ561	RES,C560-J-1/2 CT-35G21U CT-35G21UU CT-35G21CUCT-35G31U CT-35G31UU
R362	ERDS2TJ152	RES,C1.5K-J-1/4 CT-32S20U	R393	ERQ12AJ101	RES,F100-J-1/2 CT-35G21U CT-35G21UU CT-35G21CUCT-35G31U CT-35G31UU
R364	ERDS2TJ101	RES,C100-J-1/4 CT-32S20U	R395	ERDS1TJ394	RES,C390K-J-1/2 CT-35G21U CT-35G21UU CT-35G21CUCT-35G31U CT-35G31UU
R365	ERDS2TJ101	RES,C100-J-1/4 CT-32S20U	R396	ERD50TJ515	RES,C5.1MEG-J-1/2 CT-35G21U CT-35G21UU CT-35G21CUCT-35G31U CT-35G31UU
R366	ERDS2TJ101	RES,C100-J-1/4 CT-32S20U	R397	ERD50TJ515	RES,C5.1MEG-J-1/2 CT-35G21U CT-35G21UU CT-35G21CUCT-35G31U CT-35G31UU
R367	ERDS2TJ221	RES,C220-J-1/4 CT-35G21U CT-35G21UU CT-35G21CUCT-35G31U CT-35G31UU	R399	ERD50TJ515	RES,C5.1MEG-J-1/2 CT-35G21U CT-35G21UU CT-35G21CUCT-35G31U CT-35G31UU
R368	ERDS2TJ221	RES,C220-J-1/4 CT-35G21U CT-35G21UU CT-35G21CUCT-35G31U CT-35G31UU	R401	ERDS2TJ224	RES,C220K-J-1/4
R369	ERDS2TJ221	RES,C220-J-1/4 CT-35G21U CT-35G21UU CT-35G21CUCT-35G31U CT-35G31UU	R402	ERDS2TJ561	RES,C560-J-1/4
R370	ERDS2TJ101	RES,C100-J-1/4 CT-35G21U CT-35G21UU CT-35G21CUCT-35G31U CT-35G31UU	R404	ERDS2TJ221	RES,C220-J-1/4
R371	ERDS2TJ471	RES,C470-J-1/4 CT-35G21U CT-35G21UU CT-35G21CUCT-35G31U CT-35G31UU	R451	ERDS2TJ471	RES,C470-J-1/4
R372	ERDS2TJ471	RES,C470-J-1/4 CT-35G21U CT-35G21UU CT-35G21CUCT-35G31U CT-35G31UU	R452	ERDS2TJ473	RES,C47K-J-1/4
R373	ERDS2TJ471	RES,C470-J-1/4 CT-35G21U CT-35G21UU CT-35G21CUCT-35G31U CT-35G31UU	R453	EVND2AA03B34	CONTROL 30K
R374	ERG2SJS103H	RES,M10K-J-2W CT-35G21U CT-35G21UU CT-35G21CUCT-35G31U CT-35G31UU	R454	ERX1ANJ1R0	RES,M1.0-J-1W CT-35G21U CT-35G21UU CT-35G21CUCT-35G31U CT-35G31UU
R375	ERG2SJS103H	RES,M10K-J-2W CT-35G21U CT-35G21UU	R454	ERX1ANJ1R2	RES,M1.2-J-1W CT-32S20U
			R455	ERDS2TJ333	RES,C33K-J-1/4
			R456	ERDS2TJ273	RES,C27K-J-1/4

REPLACEMENT PARTS LIST

(Models: CT-32S20U, CT-35G21U/UU/CU, and CT-35G31U/UU)

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REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
R457	ERDS2TJ102	RES,C1K-J-1/4	R554	ERG3SJ470	RES,M47-J-3W CT-35G31U CT-35G31UU
R458	ERDS2TJ223	RES,C22K-J-1/4 CT-32S20U	R555	ERDS2TJ5R6	RES,C5.6-J-1/4 CT-35G31U CT-35G31UU
R458	ERDS2TJ273	RES,C27K-J-1/4 CT-35G21U CT-35G21UU CT-35G21CUCT-35G31U CT-35G31UU	R556	ERDS2TJ202	RES,C2K-J-1/4
R459	ERDS2TJ102	RES,C1K-J-1/4	R557	ERDS2TJ103	RES,C10K-J-1/4
R460	ERDS2TJ103	RES,C10K-J-1/4	R558	ERQ2CJP2R0	RES,F2.0-J-2W CT-35G21U CT-35G21UU CT-35G21CUCT-35G31U CT-35G31UU
R461	ERDS2TJ102	RES,C1K-J-1/4 CT-32S20U	R558	ERQ2CJP2R4	RES,F2.4-J-2W CT-32S20U
R462	ERDS2TJ473	RES,C47K-J-1/4	R560	ERG2ANJP561H	RES,M560-J-2W
R463	ERDS2TJ224	RES,C220K-J-1/4	R561	ERG2ANJP102H	RES,M1K-J-2W
R464	ERDS2TJ124	RES,C120K-J-1/4	R563	ERDS2TJ223	RES,C22K-J-1/4
R465	ERDS1FJ1R5	RES,C1.5-J-1/2	R564	ERDS2TJ563	RES,C56K-J-1/4
R466	ERDS2TJ101	RES,C100-J-1/4	R565	ERDS2TJ472	RES,C4.7K-J-1/4 CT-32S20U
R467	ERDS2TJ102	RES,C1K-J-1/4	R568	ERDS2TJ472	RES,C4.7K-J-1/4 CT-35G21U CT-35G21UU CT-35G21CUCT-35G31U CT-35G31UU
R470	ERDS2TJ153	RES,C15K-J-1/4	R571	ERX1SJ1R0	RES,M1.0-J-1W CT-32S20U CT-35G21U CT-35G21UUCT-35G21CU
R471	ERDS2TJ271	RES,C270-J-1/4	R601	ERDS2TJ152	RES,C1.5K-J-1/4
R473	ERDS2TJ102	RES,C1K-J-1/4 CT-35G21U CT-35G21UU CT-35G21CUCT-35G31U CT-35G31UU	R602	ERDS2TJ392	RES,C3.9K-J-1/4
R501	ERDS2TJ102	RES,C1K-J-1/4	R604	ERDS2TJ331	RES,C330-J-1/4
R502	ERDS2TJ272	RES,C27K-J-1/4	R605	ERDS2TJ331	RES,C330-J-1/4
R503	ERDS2TJ182	RES,C1.8K-J-1/4	R606	ERDS2TJ331	RES,C330-J-1/4
R504	ERDS2TJ561	RES,C560-J-1/4	R614	ERDS2TJ222	RES,C2.2K-J-1/4
R505	ERDS2TJ561	RES,C560-J-1/4	R615	ERDS2TJ222	RES,C2.2K-J-1/4
R506	ERDS2TJ100	RES,C10-J-1/4	R616	ERDS2TJ222	RES,C2.2K-J-1/4
R507	ERDS2TJ562	RES,C5.6K-J-1/4	R617	ERDS2TJ222	RES,C2.2K-J-1/4
R508	ERDS2TJ562	RES,C5.6K-J-1/4	R619	ERDS2TJ331	RES,C330-J-1/4
R509	ERG2ANJP562H	RES,M5.6K-J-2W	R752	ERDS2TJ333	RES,C33K-J-1/4 CT-32S20U
R510	ERG3ANJ242	RES,M2.4K-J-3W	R752	ERDS2TJ473	RES,C47K-J-1/4 CT-35G21U CT-35G21UU CT-35G21CUCT-35G31U CT-35G31UU
R511	ERG3ANJ242	RES,M2.4K-J-3W	R753	ERDS2TJ103	RES,C10K-J-1/4 CT-32S20U
R514	ERDS2TJ561	RES,C560-J-1/4	R753	ERDS2TJ123	RES,C12K-J-1/4 CT-35G21U CT-35G21UU CT-35G21CUCT-35G31U CT-35G31UU
R515	ERDS2TJ224	RES,C220K-J-1/4	R754	ERQ14AJ221	RES,F220-J-1/4
R531	ERD25FJ470	RES,C47-J-1/4	R755	ERDS2TJ563	RES,C56K-J-1/4
R532	ERDS2CKF5362	RES,M53.6K-F-1/4	R756	ERDS2TJ103	RES,C10K-J-1/4
R533	ERDS2CKF6491	RES,M6.49K-F-1/4	R757	ERDS2TJ224	RES,C220K-J-1/4
R534	ERDS2TJ684	RES,C680K-J-1/4	R758	ERDS2TJ273	RES,C27K-J-1/4
R538	ERDS2TJ821	RES,C820-J-1/4	R759	ERDS2TJ222	RES,C2.2K-J-1/4
R539	ERDS2TJ681	RES,C680-J-1/4	R760	EVND8AA03B53	CONTROL 5K
R540	ERDS2TJ101	RES,C100-J-1/4	R761	EVND8AA03B14	CONTROL 10K
R551	ERQ2CJP4R7	RES,F4.7-J-2W CT-35G31U CT-35G31UU CT-35G21U CT-35G21UU CT-35G21UUCT-35G21CU	R762	ERDS2TJ182	RES,C1.8K-J-1/4
R551	ERX1ANJ1R0	RES,M1.0-J-1W CT-32S20U CT-35G21U CT-35G21UUCT-35G21CU			
R552	ERG3SJS101H	RES,M100-J-3W CT-35G31U CT-35G31UU			
R552	ERG3SJS181H	RES,M180-J-3W CT-32S20U CT-35G21U CT-35G21UUCT-35G21CU			
R554	ERG2ANJ390	RES,M39-J-2W CT-32S20U CT-35G21U CT-35G21UUCT-35G21CU			

REPLACEMENT PARTS LIST

(Models: CT-32S20U, CT-35G21U/UU/CU, and CT-35G31U/UU)

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
R763	ERDS2TJ183	RES, C 18K-J-1/4	R1832	ERJ6GEYJ221	RES, M220-J-1/10
R764	ERDS2TJ124	RES, C 120K-J-1/4	R1833	ERJ6GEYJ221	RES, M220-J-1/10
R765	ERDS2TJ272	RES, C 2.7K-J-1/4	R2106	ERJ6GEYJ183	RES, M18K-J-1/10
R766	ERDS2TJ362	RES, C 3.6K-J-1/4			CT-35G31U CT-35G31UU
R767	ERDS2TJ222	RES, C 2.2K-J-1/4	R2109	ERJ6GEYJ683	RES, M68K-J-1/10
R768	ERQ2CJP100	RES, F 10-J-2W			CT-35G31U CT-35G31UU
R801	ERF7ZKR82	RES, W .82-K-7W	R2110	ERJ6GEYJ331	RES, M330-J-1/10
R804	ERG2ANJ333	RES, M33K-J-2W			CT-35G31U CT-35G31UU
R805	ERF2AKR22	RES, W 22-K-2W	R2111	ERJ6GEYJ152	RES, M1.5K-J-1/10
R806	ERDS2TJ273	RES, C 2.7K-J-1/4			CT-35G31U CT-35G31UU
R807	ERDS1FJ132	RES, C 1.3K-J-1/2	R2112	ERJ6GEYJ331	RES, M330-J-1/10
R811	ERQ1CKPR33	RES, F .33-K-1W			CT-35G31U CT-35G31UU
R812	ERQ1CKR33	RES, F .33-K-1W	R2113	ERJ6GEYJ102	RES, M1K-J-1/10
R814	ERDS2TJ185	RES, C 1.8MEG-J-1/4			CT-35G31U CT-35G31UU
R815	ERC12ZGM825	RES, S .82MEG-M-1/2	R2114	ERJ6GEYJ681	RES, M680-J-1/10
R816	ERDS2TJ105	RES, C 1MEG-J-1/4			CT-35G31U CT-35G31UU
R817	ERDS2TJ185	RES, C 1.8MEG-J-1/4	R2116	ERJ6GEYJ102	RES, M1K-J-1/10
R818	ERDS1TJ101	RES, C 100-J-1/2			CT-35G31U CT-35G31UU
		CT-35G21U CT-35G21UU	R2117	ERJ6GEYJ121	RES, M120-J-1/10
		CT-35G21CU			CT-35G31U CT-35G31UU
R818	ERDS2TJ101	RES, C 100-J-1/4	R2118	EVND8AA03B14	CONTROL 10K
		CT-32S20U CT-35G31U			CT-35G31U CT-35G31UU
		CT-35G31UU	R2119	ERJ6GEYJ392	RES, M3.9K-J-1/10
R819	ERDS1FJ1R0	RES, C 1.0-J-1/2			CT-35G31U CT-35G31UU
R1023	ERDS2TJ102	RES, C 1K-J-1/4	R2121	ERJ6GEYJ221	RES, M220-J-1/10
R1024	ERDS2TJ103	RES, C 10K-J-1/4			CT-35G31U CT-35G31UU
R1025	ERDS2TJ103	RES, C 10K-J-1/4	R2122	ERJ6GEYJ473	RES, M47K-J-1/10
R1029	ERDS2TJ102	RES, C 1K-J-1/4			CT-35G31U CT-35G31UU
R1030	ERDS2TJ473	RES, C 47K-J-1/4	R2123	ERJ6GEYJ473	RES, M47K-J-1/10
R1051	ERDS2TJ102	RES, C 1K-J-1/4			CT-35G31U CT-35G31UU
R1801	ERJ6GEYJ101	RES, M100-J-1/10	R2124	ERJ6GEYJ332	RES, M3.3K-J-1/10
R1802	ERJ6GEYJ101	RES, M100-J-1/10			CT-35G31U CT-35G31UU
R1803	ERJ6GEYJ103	RES, M10K-J-1/10	R2127	ERJ6GEYJ101	RES, M100-J-1/10
R1804	ERJ6GEYJ562	RES, M5.6K-J-1/10			CT-35G31U CT-35G31UU
R1805	ERJ6GEYJ562	RES, M5.6K-J-1/10	R2201	ERDS2TJ472	RES, C 4.7K-J-1/4
R1806	ERJ6GEYJ750	RES, M75-J-1/10	R2202	ERDS2TJ153	RES, C 15K-J-1/4
R1807	ERJ6GEYJ750	RES, M75-J-1/10	R2203	ERDS2TJ104	RES, C 100K-J-1/4
R1811	ERJ6GEYJ103	RES, M10K-J-1/10	R2204	ERDS2TJ473	RES, C 47K-J-1/4
R1812	ERJ6GEYJ103	RES, M10K-J-1/10	R2205	ERDS2TJ154	RES, C 150K-J-1/4
R1813	ERJ6GEYJ103	RES, M10K-J-1/10	R2206	ERDS2TJ471	RES, C 470-J-1/4
R1814	EVND8AA03B23	CONTROL 2K	R2207	ERDS2TJ471	RES, C 470-J-1/4
R1815	ERJ6GEYJ473	RES, M47K-J-1/10	R2208	EROS2CKF9102	RES, M91K-F-1/4
R1816	ERJ6GEYJ473	RES, M47K-J-1/10	R2212	ERDS2TJ682	RES, C 6.8K-J-1/4
R1817	ERJ6GEYJ683	RES, M68K-J-1/10	R2220	ERDS2TJ682	RES, C 6.8K-J-1/4
R1818	ERJ6GEYJ562	RES, M5.6K-J-1/10	R2221	ERDS2TJ472	RES, C 4.7K-J-1/4
R1819	ERJ6GEYJ153	RES, M15K-J-1/10	R2301	ERDS2TJ102	RES, C 1K-J-1/4
R1821	ERJ6GEYJ221	RES, M220-J-1/10			CT-32S20U CT-35G21U
R1822	ERJ6GEYJ221	RES, M220-J-1/10			CT-35G21U/CT-35G21CU
R1823	ERJ6GEYJ221	RES, M220-J-1/10	R2301	ERDS2TJ621	RES, C 820-J-1/4
R1824	ERJ6GEYJ221	RES, M220-J-1/10			CT-35G31U CT-35G31UU
R1825	ERJ6GEYJ221	RES, M220-J-1/10	R2302	ERDS2TJ102	RES, C 1K-J-1/4
R1826	ERJ6GEYJ221	RES, M220-J-1/10			CT-32S20U CT-35G21U
R1827	ERJ6GEYJ221	RES, M220-J-1/10			CT-35G21U/CT-35G21CU
R1828	ERJ6GEYJ221	RES, M220-J-1/10	R2302	ERDS2TJ621	RES, C 820-J-1/4
R1830	ERJ6GEYJ221	RES, M220-J-1/10			CT-35G31U CT-35G31UU
R1831	ERJ6GEYJ221	RES, M220-J-1/10	R2303	ERDS2TJ912	RES, C 9.1K-J-1/4

REPLACEMENT PARTS LIST

(Models: CT-32S20U, CT-35G21U/UU/CU, and CT-35G31U/UU)

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
R2304	ERDS2TJ912	RES,C9.1K-J-1/4	R2416	ERJ6GEYJ104	RES,M100K-J-1/10
R2305	ERD25FJ2R2	RES,C2.2-J-1/4	R2451	ERJ6GEYJ225	RES,M2.2MEG-J-1/10
R2306	ERD25FJ2R2	RES,C2.2-J-1/4	R2455	ERJ6GEYJ243	RES,M24K-J-1/10
R2307	ERDS2TJ392	RES,C3.9K-J-1/4	R2456	ERDS2TJ103	RES,C10K-J-1/4
R2308	ERDS2TJ392	RES,C3.9K-J-1/4	R3001	ERJ6GEYJ102	RES,M1K-J-1/10
R2310	ERDS2TJ103	RES,C10K-J-1/4	R3003	ERJ6GEYJ184	RES,M180K-J-1/10
R2311	ERDS2TJ103	RES,C10K-J-1/4	R3004	ERJ6GEYJ184	RES,M180K-J-1/10
R2312	ERJ6GEYJ104	RES,M100K-J-1/10	R3005	ERJ6GEYJ101	RES,M100-J-1/10
R2312	ERJ6GEYJ184	CT-35G31U CT-35G31UU	R3006	ERJ6GEYJ750	RES,M75-J-1/10
		RES,M180K-J-1/10	R3008	ERJ6GEYJ680	RES,M68-J-1/10
		CT-32S20U CT-35G21U	R3009	ERJ6GEYJ101	RES,M100-J-1/10
		CT-35G21UU CT-35G21CU	R3010	ERJ6GEYJ750	RES,M75-J-1/10
R2313	ERJ6GEYJ104	RES,M100K-J-1/10	R3011	ERJ6GEYJ101	RES,M100-J-1/10
R2315	ERDS2TJ682	RES,C6.8K-J-1/4	R3012	ERJ6GEYJ683	RES,M68K-J-1/10
R2316	ERDS2TJ331	RES,C330-J-1/4	R3014	ERJ6GEYJ103	RES,M10K-J-1/10
R2340	ERJ6GEYJ332	RES,M3.3K-J-1/10	R3015	ERJ6GEYJ104	RES,M100K-J-1/10
R2342	ERJ6GEYJ333	RES,M33K-J-1/10	R3016	ERJ6GEYJ221	RES,M220-J-1/10
R2345	ERJ6GEYJ472	RES,M4.7K-J-1/10	R3017	ERJ6GEYJ102	RES,M1K-J-1/10
R2346	ERJ6GEYJ332	RES,M3.3K-J-1/10	R3024	ERJ6GEYJ102	RES,M1K-J-1/10
R2348	ERJ6GEYJ333	RES,M33K-J-1/10	R3025	ERJ6GEYJ470	RES,M47-J-1/10
R2349	ERJ6GEYJ472	RES,M4.7K-J-1/10	R3031	ERJ6GEYJ101	RES,M100-J-1/10
R2350	ERJ6GEYJ332	RES,M3.3K-J-1/10	R3032	ERJ6GEYJ750	RES,M75-J-1/10
R2351	ERJ6GEYJ222	RES,M2.2K-J-1/10	R3033	ERJ6GEYJ184	RES,M180K-J-1/10
R2352	ERJ6GEYJ332	RES,M3.3K-J-1/10	R3034	ERJ6GEYJ102	RES,M1K-J-1/10
R2353	ERJ6GEYJ222	RES,M2.2K-J-1/10	R3035	ERJ6GEYJ184	RES,M180K-J-1/10
R2354	ERJ6GEYJ681	RES,M680-J-1/10	R3036	ERJ6GEYJ102	RES,M1K-J-1/10
R2355	ERJ6GEYJ223	RES,M22K-J-1/10	R3037	ERJ6GEYJ683	RES,M68K-J-1/10
R2356	ERJ6GEYJ223	RES,M22K-J-1/10	R3038	ERJ6GEYJ683	RES,M68K-J-1/10
R2357	ERJ6GEYJ752	RES,M7.5K-J-1/10	R3071	ERJ6GEYJ223	RES,M22K-J-1/10
R2358	ERJ6GEYJ272	RES,M27K-J-1/10	R3072	ERJ6GEYJ683	RES,M68K-J-1/10
R2359	ERJ6GEYJ333	RES,M33K-J-1/10	R3073	ERJ6GEYJ683	RES,M68K-J-1/10
R2360	ERJ6GEYJ153	RES,M15K-J-1/10	R3074	ERJ6GEYJ223	RES,M22K-J-1/10
R2362	ERJ6GEYJ473	RES,M47K-J-1/10	R3075	ERJ6GEYJ102	RES,M1K-J-1/10
R2363	ERJ6GEYJ473	RES,M47K-J-1/10	R3076	ERJ6GEYJ102	RES,M1K-J-1/10
R2364	ERJ6GEYJ223	RES,M22K-J-1/10	R3077	ERJ6GEYJ152	RES,M1.5K-J-1/10
R2365	ERJ6GEYJ103	RES,M10K-J-1/10	R3078	ERJ6GEYJ471	RES,M470-J-1/10
R2366	ERJ6GEYJ182	RES,M1.8K-J-1/10	R3079	ERJ6GEYJ101	RES,M100-J-1/10
R2401	ERJ6GEYJ392	RES,M3.9K-J-1/10	R3080	ERJ6GEYJ471	RES,M470-J-1/10
R2402	ERJ6GEYJ392	RES,M3.9K-J-1/10	R3201	ERJ6GEYJ103	RES,M10K-J-1/10
R2403	ERJ6GEYJ103	RES,M10K-J-1/10	R3202	ERJ6GEYJ223	RES,M22K-J-1/10
R2404	ERJ6GEYJ152	CT-35G31U CT-35G31UU	R3203	ERJ6GEYJ101	RES,M100-J-1/10
		RES,M1.5K-J-1/10	R3204	ERJ6GEYJ102	RES,M1K-J-1/10
		CT-35G31U CT-35G31UU	R3205	ERJ6GEYJ272	RES,M2.7K-J-1/10
R2405	ERJ6GEYJ824	RES,M820K-J-1/10	R3206	ERJ6GEYJ682	RES,M6.8K-J-1/10
		CT-35G31U CT-35G31UU	R3207	ERJ6GEYJ103	RES,M10K-J-1/10
R2406	ERJ6GEYJ332	RES,M3.3K-J-1/10	R3208	ERJ6GEYJ102	RES,M1K-J-1/10
R2407	ERJ6GEYJ103	CT-35G31U CT-35G31UU	R3209	ERJ6GEYJ102	RES,M1K-J-1/10
		RES,M10K-J-1/10	R3210	ERJ6GEYJ103	RES,M10K-J-1/10
R2410	ERJ6GEYJ39F9	CT-35G31U CT-35G31UU	R3211	ERJ6GEYJ181	RES,M180-J-1/10
		RES,M3.9K-J-1/10	R3212	ERJ6GEYJ331	RES,M330-J-1/10
R2411	ERJ6GEYJ103	CT-35G31U CT-35G31UU	R3213	ERJ6GEYJ102	RES,M1K-J-1/10
		RES,M10K-J-1/10	R3214	ERJ6GEYJ331	RES,M330-J-1/10
R2412	ERJ6GEYJ104	RES,M100K-J-1/10	R3215	EVND8AA03B22	CONTROL 200 OHM
R2414	ERJ6GEYJ223	RES,M22K-J-1/10	R3217	ERJ6GEYJ271	RES,M270-J-1/10
R2415	ERJ6GEYJ473	CT-35G31U CT-35G31UU	R3218	ERJ6GEYJ122	RES,M1.2K-J-1/10
		RES,M47K-J-1/10	R3220	ERJ6GEYJ331	RES,M330-J-1/10

REPLACEMENT PARTS LIST

(Models: CT-32S20U, CT-35G21U/UU/CU, and CT-35G31U/UU)

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
R3221	ERJ6GEYJ122	RES,M1.2K-J-1/10	R4415	ERJ6GEYJ101	RES,M100-J-1/10
R3222	ERJ6GEYJ471	RES,M470-J-1/10	R4417	ERJ6GEYJ101	RES,M100-J-1/10
R3223	ERJ6GEYJ471	RES,M470-J-1/10	R4418	ERJ6GEYJ101	RES,M100-J-1/10
R3224	ERJ6GEYJ471	RES,M470-J-1/10	R4419	ERJ6GEYJ101	RES,M100-J-1/10
R3227	ERJ6GEYJ332	RES,M3.3K-J-1/10		CT-35G31U	CT-35G31U
R3228	ERJ6GEYJ104	RES,M100K-J-1/10	R4420	ERJ6GEYJ103	RES,M10K-J-1/10
R3229	ERJ6GEYJ152	RES,M1.5K-J-1/10	R4421	ERJ6GEYJ103	RES,M10K-J-1/10
R3290	ERDS2TJ561	RES,C560-J-1/4	R4423	ERJ6GEYJ473	RES,M47K-J-1/10
		CT-35G21U CT-35G21UU	R4424	ERJ6GEYJ473	RES,M47K-J-1/10
		CT-35G21CUCT-35G31U	R4426	ERJ6GEYJ561	RES,M560-J-1/10
		CT-35G31UU	R4427	ERJ6GEYJ223	RES,M22K-J-1/10
R3291	ERDS2TJ182	RES,C1.8K-J-1/4	R4428	ERJ6GEYJ222	RES,M2.2K-J-1/10
		CT-35G21U CT-35G21UU	R4441	ERJ6GEYJ101	RES,M100-J-1/10
		CT-35G21CUCT-35G31U	R4442	ERJ6GEYJ102	RES,M1K-J-1/10
		CT-35G31UU			SWITCHES
R3293	ERDS2TJ391	RES,C390-J-1/4	S001	EVQQKH06K	POWER
		CT-35G21U CT-35G21UU			CT-32S20U
		CT-35G21CUCT-35G31U	S002	EVQQKH06K	VOL DOWN
		CT-35G31UU			CT-32S20U
R3294	ERDS2TJ101	RES,C100-J-1/4	S003	EVQQKH06K	VOL UP
		CT-35G21U CT-35G21UU			CT-32S20U
		CT-35G21CUCT-35G31U	S004	EVQQKH06K	CH DOWN
		CT-35G31UU			CT-32S20U
R4356	ERJ6GEYJ681	RES,M680-J-1/10	S005	EVQQKH06K	CH UP
R4358	ERJ6GEYJ102	RES,M1K-J-1/10			CT-32S20U
R4359	ERJ6GEYJ471	RES,M470-J-1/10	S006	EVQQKH06K	ACTION
R4360	ERJ6GEYJ102	RES,M1K-J-1/10			CT-32S20U
R4361	ERJ6GEYJ560	RES,M56-J-1/10	S007	EVQQKH06K	TV/VIDEO
R4362	ERJ6GEYJ561	RES,M560-J-1/10			CT-32S20U
R4363	ERJ6GEYJ471	RES,M470-J-1/10	S010	EVQQVC13T	SWITCH
R4364	ERJ6GEYJ102	RES,M1K-J-1/10			CT-35G21U CT-35G21UU
R4365	ERJ6GEYJ683	RES,M68K-J-1/10			CT-35G21CUCT-35G31U
R4367	ERJ6GEYJ331	RES,M330-J-1/10			CT-35G31UU
R4368	ERJ6GEYJ510	RES,M51-J-1/10	S011	EVQQVC13T	SWITCH
R4369	ERJ6GEYJ105	RES,M1.0MEG-J-1/10			CT-35G21U CT-35G21UU
R4370	ERJ6GEYJ222	RES,M2.2K-J-1/10			CT-35G21CUCT-35G31U
R4371	ERJ6GEYJ102	RES,M1K-J-1/10			CT-35G31UU
R4372	ERJ6GEYJ471	RES,M470-J-1/10	S012	EVQQVC13T	SWITCH
R4373	ERJ6GEYJ822	RES,M8.2K-J-1/10			CT-35G21U CT-35G21UU
R4374	ERJ6GEYJ273	RES,M27K-J-1/10			CT-35G21CUCT-35G31U
R4375	ERJ6GEYJ221	RES,M220-J-1/10			CT-35G31UU
R4376	ERJ6GEYJ471	RES,M470-J-1/10	S013	EVQQVC13T	SWITCH
R4377	ERJ6GEYJ223	RES,M22K-J-1/10			CT-35G21U CT-35G21UU
R4378	ERJ6GEYJ562	RES,M5.6K-J-1/10			CT-35G21CUCT-35G31U
R4379	ERJ6GEYJ103	RES,M10K-J-1/10			CT-35G31UU
R4380	ERJ6GEYJ683	RES,M68K-J-1/10	S014	EVQQVC13T	SWITCH
R4381	ERJ6GEYJ331	RES,M330-J-1/10			CT-35G21U CT-35G21UU
R4382	ERJ6GEYJ101	RES,M100-J-1/10			CT-35G21CUCT-35G31U
R4383	ERJ6GEYJ471	RES,M470-J-1/10			CT-35G31UU
R4384	ERJ6GEYJ331	RES,M330-J-1/10	S015	EVQQVC13T	SWITCH
R4395	ERJ6GEYJ102	RES,M1K-J-1/10			CT-35G21U CT-35G21UU
R4396	ERJ6GEYJ471	RES,M470-J-1/10			CT-35G21CUCT-35G31U
R4397	ERJ6GEYJ393	RES,M39K-J-1/10			CT-35G31UU
R4398	ERJ6GEYJ334	RES,M330K-J-1/10	S016	EVQQVC13T	SWITCH
R4399	ERJ6GEYJ272	RES,M2.7K-J-1/10			CT-35G21U CT-35G21UU
R4414	ERJ6GEYJ101	RES,M100-J-1/10			CT-35G21CUCT-35G31U

REPLACEMENT PARTS LIST

(Models: CT-32S20U, CT-35G21U/UU/CU, and CT-35G31U/UU)

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
TNR001	ENV568Q8G3	CT-35G31UU TRANSFORMERS TUNER CT-35G21U CT-35G21UU CT-35G21CU CT-35G31U CT-35G31UU	M009	TBX2A50191G	CT-32S20U ASSY, 7 PUSHBUTTON CT-35G21U CT-35G21UU CT-35G21CU CT-35G31U CT-35G31UU
TNR001	ENV568Q9G3	TUNER CT-32S20U	M010	TBX2A50251G	BUTTON, 7 KEY CT-32S20U
TNR002	ENV56D02G3	TUNER CT-35G31U CT-35G31UU	JK351	TJS1A5050	CRT SOCKET CT-32S20U
T001	TLP16297	TRANSFORMER, POWER SUPPLY	JK351	TJS2A5001	CRT SOCKET CT-35G21U CT-35G21UU CT-35G21CU CT-35G31U CT-35G31UU
T501	TLH15452	TRANSFORMER, HORIZONTAL DRIVER	M011	TKN2A90011	SPEAKER GRILLE CT-35G21U CT-35G21UU CT-35G21CU CT-35G31U CT-35G31UU
T551	KFT6AA022F	TRANSFORMER CT-35G21U CT-35G21UU CT-35G21CU CT-35G31U CT-35G31UU	M012	TKP2AA00501	BATTERY COVER, REMOTE
T551	OLF04508F	TRANSFORMER, FLYBACK CT-32S20U	M013	TKP2A11221	PANEL, SMOKE CT-32S20U
T801	ETS39AG115AC	TRANSFORMER, POWER CRYSTALS/FILTERS	M014	TKB2A28132	CABINET, WOOD TABLE CT-35G21U CT-35G21UU CT-35G21CU CT-35G31U CT-35G31UU
X001	TSS2080MX	CRYSTAL, 12 MHZ CLOCK	M015	TKU2A11902	COVER, CABINET BACK CT-35G21U CT-35G21UU CT-35G21CU CT-35G31U CT-35G31UU
X101	EFCKM1963M	CERAMIC FILTER	M016	TLC2047-2	MAGNET, RINGS: PURITY & STATIC CONV. CT-32S20U
X102	EFCWS4504AB	FILTER 4.5MHZ	M017	TMK2A233	INSULATOR, INFRARED CT-35G21U CT-35G21UU CT-35G21CU CT-35G31U CT-35G31UU
X201	EFC54R5MS4W	FILTER 4.5MHZ BANDPASS	M018	TMM2A14001	LED/INFRA-RED HOLDER CT-35G21U CT-35G21UU CT-35G21CU CT-35G31U CT-35G31UU
X501	EFOA503KS41	CRYSTAL, 503KHZ OSCILLATOR	M019	TMM2A30701	WEDGE, YOKE
X601	TS816M32	CRYSTAL, 3.58MHZ OSCILLATOR	M020	TMW2A9142	BRACKET, REAR A/V CT-35G21U CT-35G21UU CT-35G21CU CT-35G31U CT-35G31UU
X2102	EFCWS4504AB	FILTER 4.5MHZ CT-35G31U CT-35G31UU	M021	TMW2A9151	BRKT., SPEAKER CT-32S20U
X2103	EFCKM1958M	CERAMIC FILTER CT-35G31U CT-35G31UU	M022	TMW2A97121	STRAIN RELIEF: AC LINE CORD CT-32S20U
X4351	TSS2163-M	CRYSTAL, 14.3MHZ OSCILLATOR	M023	TNQ2AE002	REMOTE CONTROL CT-32S20U
M001	A89FL50X	OTHERS CRT 35" CT-35G21U CT-35G21UU CT-35G21CU CT-35G31U CT-35G31UU	M024	TNQ2AE006	REMOTE CONTROL CT-35G31U CT-35G31UU
M002	ENPE620	ANTENNA UNIT CT-35G31U CT-35G31UU	M025	TNQ2AE007	TRANSMITTER, REMOTE CONTR CT-35G21U CT-35G21UU CT-35G21CU
M003	ETC39C9NA	YOKE, CONVERGENCE CT-35G21U CT-35G21UU CT-35G21CU CT-35G31U CT-35G31UU	M026	TQB2AA0060	MANUAL, OWNER'S CT-32S20U
M004	M60JUA081X	CRT 32" CT-32S20U			
M005	TAS2A0002	SPEAKER, 8 OHM CT-35G21U CT-35G21UU CT-35G21CU CT-35G31U CT-35G31UU			
M006	TAS2A9D07	SPEAKER 5" X 2.2" CT-32S20U			
M007	TBM2A10111	BADGE, PANASONIC CT-35G21U CT-35G21UU CT-35G21CU CT-35G31U CT-35G31UU			
M008	TBM2A10141	BADGE, PANASONIC			

REPLACEMENT PARTS LIST

(Models: CT-32S20U, CT-35G21U/UU/CU, and CT-35G31U/UU)

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
M027	TQB2AA0073	MANUAL, OWNER'S CT-35G31U CT-35G31UU	M032	TXFKU4896SER	ASSY, CABINET BACK CT-32S20U
M028	TQB2AA0074	MANUAL, OWNER'S CT-35G21U CT-35G21UU	M033	TXFKY5996SER	ASSY, CABINET FRONT CT-32S20U
M029	TQB2AA0075	MANUAL, OWNER'S CT-35G21CU	M034	TXF3A01AFR	ASSY., DAG GND CT-32S20U
M030	TSX2AA0011	LINE CORD 2CON-18AWG CT-32S20U	M035	TXF3A025QA	ASSY, DAG GND CT-35G21U CT-35G21UU CT-35G21CU CT-35G31U
M031	TXFKE0295SER	ASSY, ESCUTCHEON CT-35G21U CT-35G21UU CT-35G21CU CT-35G31U CT-35G31UU	M036	0FMK014ZZ	CT-35G31UU CONVERGENCE CORRECTOR STRIP
			JK3031	TJB18619	AV TERMINAL (2AV VAO)

DESCRIPTION OF ABBREVIATIONS GUIDE

RESISTOR			
TYPE		TOLERANCE	
C	Carbon	F	$\pm 1\%$
F	Fuse	J	$\pm 5\%$
M	Metal Oxide	K	$\pm 10\%$
S	Solid	M	$\pm 20\%$
W	Wire Wound	G	$\pm 2\%$

RES, C270-J-1/4

CAPACITOR			
TYPE		TOLERANCE	
C	Ceramic	C	$\pm 0.25\mu F$
E	Electrolytic	D	$\pm 0.5\mu F$
P	Polyester	F	$\pm 1\mu F$
S	Styrol	J	$\pm 5\%$
T	Tantalum	K	$\pm 10\%$
		L	$\pm 15\%$
		M	$\pm 20\%$
		P	$+100\% - 0\%$
		Z	$+80\% - 20\%$

CAP, P .068UF-K-50V

SERVICEMAN MODE (ELECTRONIC CONTROL) SERVICE ADJUSTMENT VALUES

Model _____ Ser # _____ Date _____

Note: Record the original settings PRIOR to modifying the registers.

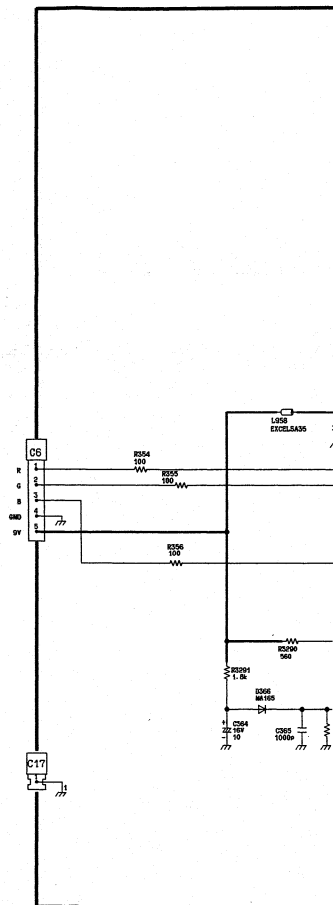
Mode	Service Adjustment	Adjustment Range	Def. Val.	Original Value	New Value
DAC Adjustments					
B0	Sub Bright	0 ~ 255	128		
B1	Sub Color	0 ~ 63	33		
B2	Sub Tint	0 ~ 63	33		
B3	Sub Contrast	0 ~ 63	34		
B4	Video Adjust.	0 ~ 15	8		
B5	Audio Adjust.	0 ~ 15	8		
CRT Adjustments					
C0	Horiz. Centering	0 ~ 15	8		
C1	RED Cutoff	0 ~ 255 *	128		
C2	GRN Cutoff	0 ~ 255 *	128		
C3	BLU Cutoff	0 ~ 255 *	128		
C4	RED Drive	0 ~ 255	128		
C5	BLU Drive	0 ~ 255	128		

* Adjustment indicated in 2 steps:
0 ~ 255 then 1 ~ 255

Mode	Service Adjustment	Adjustment Range	Def. Val.	Original Value	New Value
Options Adjustments					
S0	PIP Color	0 ~ 127	25		
S1	PIP Tint	0 ~ 127	55		
S2	PIP Sync.	0 ~ 7	4		
S3	Upper 1/9	0 ~ 255	229		
S4	Lower 1/9	0 ~ 255	111		
S5	Left 1/9	0 ~ 255	27		
S6	Right 1/9	0 ~ 255	123		
S7	Upper 1/16	0 ~ 255	229		
S8	Lower 1/16	0 ~ 255	93		
S9	Left 1/16	0 ~ 255	27		
Sa	Right 1/16	0 ~ 255	137		
Sb	Clock Adjust.	0 ~ 255	128		
MTS Adjustments					
M0	Input Level	0 ~ 63	31		
M1	Stereo PLL VCO	0 ~ 63	31		
M2	Filter	0 ~ 63	31		
M3	Low Level Separ.	0 ~ 63	31		
M4	High Level Separ.	0 ~ 63	31		

Printed in USA
95064300A0417

E

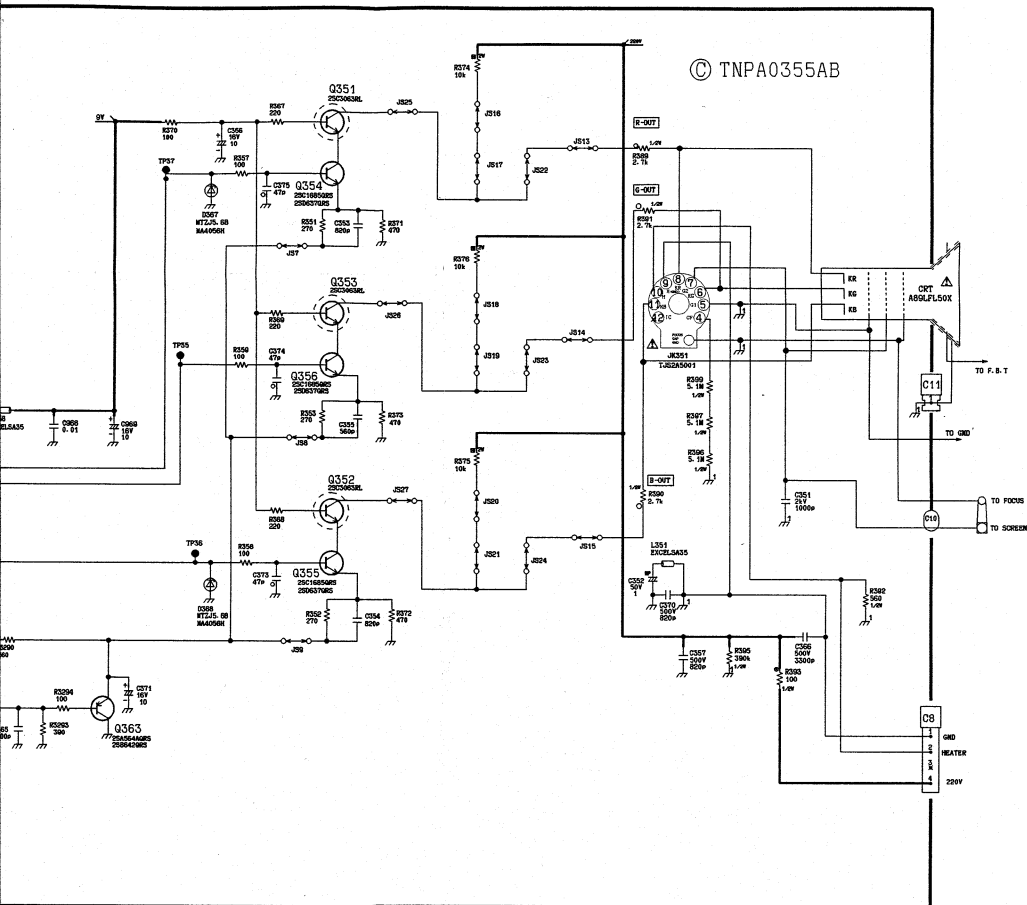


L-Board Schematic 35" Receivers

IC1802			
01	0.41	13	3.94
02	0.56	14	3.87
03	0.00	15	2.40
04	0.42	16	2.91
05	0.36	17	2.91
06	0.00	18	4.95
07	0.01	19	0.51
08	0.36	20	2.91
09	0.36	21	2.74
10	4.95	22	2.36

H

© TNPA0355AB

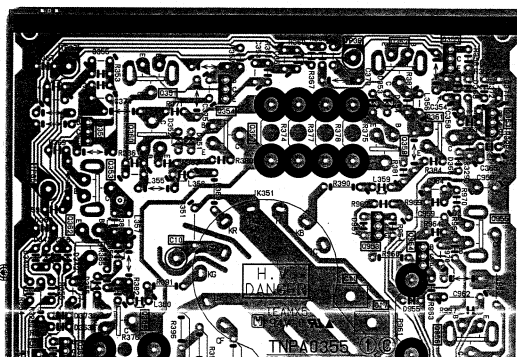


Voltage Measurements "C"-Board

	Q351	Q352	Q353	Q354
B	8.79	8.80	8.80	2.74
C	161.6	160.4	155.8	8.30
E	8.30	8.29	8.30	2.37

	Q355	Q356	Q363
B	2.75	2.85	1.49
C	8.29	8.30	0.00
E	2.35	2.45	2.20

IMPORTANT SAFETY NOTICE



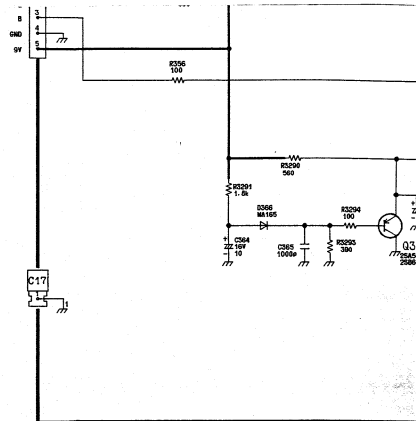
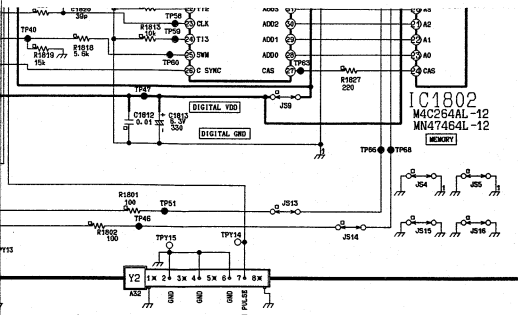


5



01	0.55	27	4.20
02	0.00	28	1.96
03	0.00	29	2.36
04	2.51	30	2.74
05	2.96	31	2.91
06	3.73	32	0.51
07	3.73	33	4.96
08	4.97	34	2.91
09	3.74	35	2.91
10	4.59	36	2.40
11	2.07	37	3.87
12	4.56	38	3.94
13	4.95	39	4.00
14	4.92	40	4.00
15	0.00	41	4.95
16	0.00	42	0.38
17	0.20	43	0.38
18	0.37	44	0.00
19	0.00	45	0.00
20	4.93	46	0.35
21	1.91	47	0.40
22	0.01	48	0.89
23	1.72	49	0.42
24	0.01	50	4.12
25	0.01	51	4.07
26	1.05	52	0.03

	Q4363	Q4369	Q4370	Q4371	Q4401
B	4.17	4.65	2.31	2.50	3.17
C	4.07	0.37	0.00	4.99	0.00
E	4.23	4.99	2.96	2.31	3.77



Note
Voltage levels indicated are for
35" Receivers. 32" Receivers
may vary.

L-Board Schematic 35" Receivers

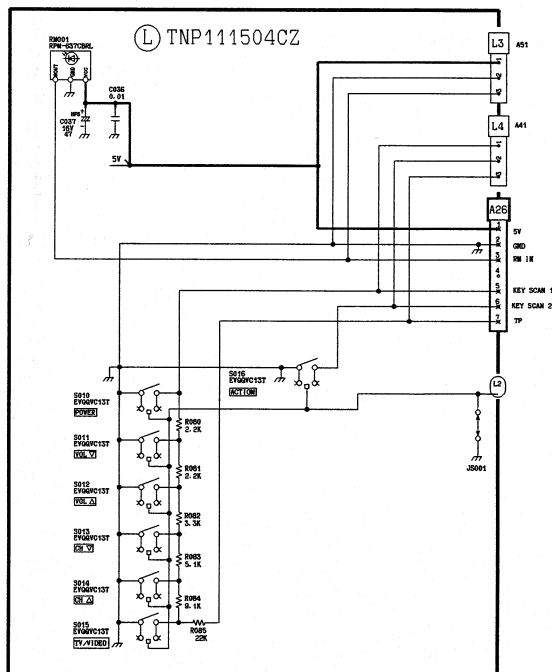
ts - "Y"-Board

IC1802

0.41	13	3.94
0.56	14	3.87
0.00	15	2.40
0.42	16	2.91
0.36	17	2.91
0.00	18	4.95
0.01	19	0.51
0.36	20	2.91
0.36	21	2.74
4.95	22	2.36
3.90	23	1.96
4.30	24	4.19

IC1803

N.C.	13	1.04
0.00	14	0.03
1.76	15	1.63
3.11	16	1.91
1.36	17	2.45
3.40	18	0.20
4.22	19	2.51
2.78	20	2.51
2.45	21	N.C.
2.89	22	3.39
4.99	23	3.73
3.33	24	N.C.



Voltage "C"

Q351	8.79
B	161.6
C	8.30
E	
Q355	2.75
B	8.29
C	2.35
E	

IMPORTA
RES. SCHEMATIC
FEATURES: 1. 1.5
RADIAL, 1.5
WHEN. 1.5
MANUFACTURERS
1.5
SCHEMATIC

Voltage Me "Z"-I

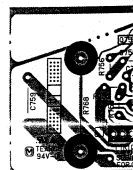
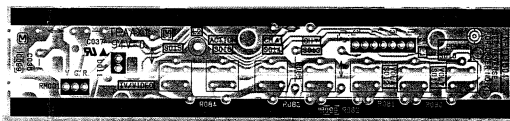
Q7	2
B	2
C	2
E	2

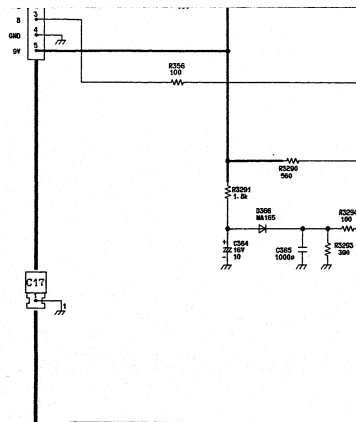
Z-Board All Re

L-Board TNP111504 35" Receivers

Q4358	Q4360	Q4361	Q4362
1.23	0.55	0.01	4.20
0.00	0.54	4.24	4.12
1.89	0.00	0.00	4.28

CHIP TRANSISTOR LEAD DESIGNATION

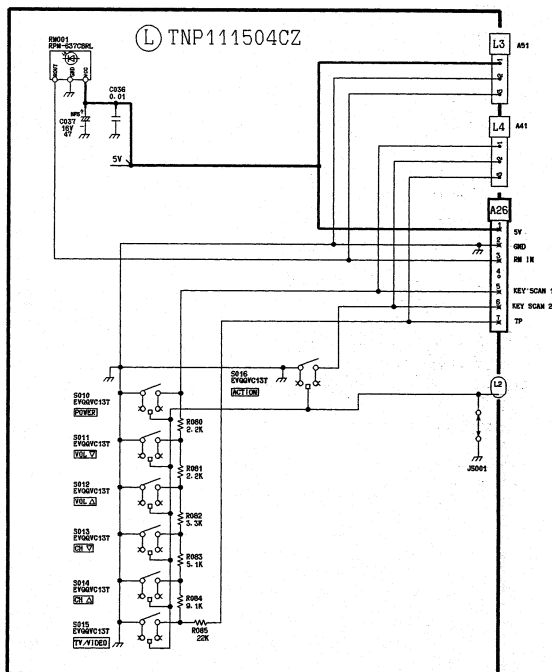




L-Board Schematic 35" Receivers

01	0.41	13	3.94
02	0.56	14	3.87
03	0.00	15	2.40
04	0.42	16	2.91
05	0.36	17	2.91
06	0.00	18	4.95
07	0.01	19	0.51
08	0.36	20	2.91
09	0.36	21	2.74
10	4.95	22	2.36
11	3.90	23	1.96
12	4.30	24	4.19

01	N.C.	13	1.04
2	0.00	14	0.03
3	1.78	15	1.63
04	3.11	16	1.91
05	1.36	17	2.45
5	3.40	18	0.20
7	4.22	19	2.51
08	2.78	20	2.51
09	2.45	21	N.C.
10	2.89	22	3.39
11	4.99	23	3.73
12	3.33	24	N.C.



BCE
BCE

THIS SC
FEATURED
X-RADIAT
WHEN 8
MANUFAC
CRITICAL
SCHEMAT

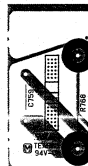
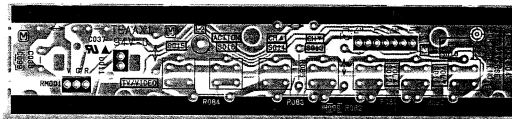
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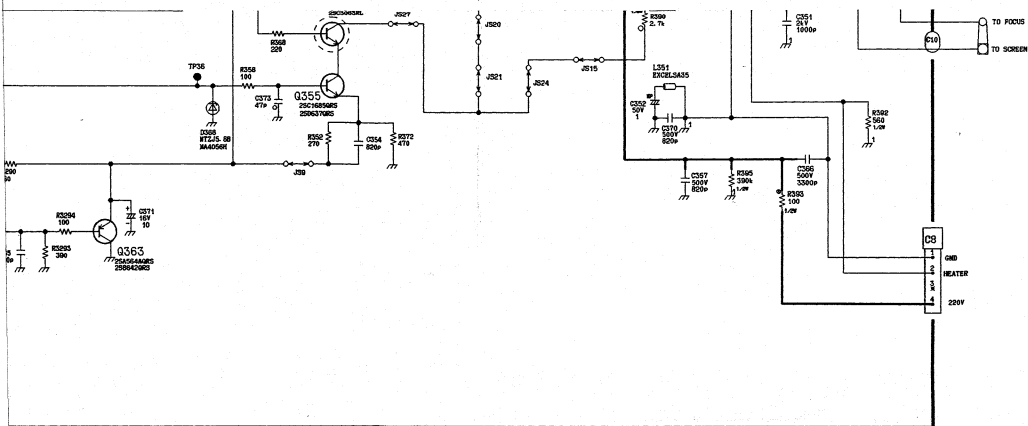
Z-Bo
Al

57	Q4358	Q4360	Q4361	Q4362
2	1.23	0.55	0.01	4.20
J	0.00	0.54	4.24	4.12
06	1.89	0.00	0.00	4.28

B	1000	C
E	1000	1000
E	1000	1000

L-Board TNP111504 35" Receivers





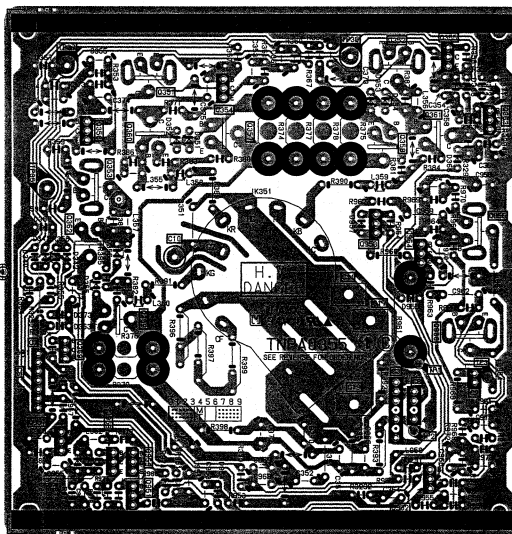
C-Board TNPA0355
35" Receivers

Voltage Measurements "C"-Board

	Q351	Q352	Q353	Q354
B	8.79	8.80	8.80	2.74
C	161.6	160.4	155.8	8.30
E	8.30	8.29	8.30	2.37

	Q355	Q356	Q363
B	2.75	2.85	1.49
C	8.29	8.30	0.00
E	2.35	2.45	2.20

IMPORTANT SAFETY NOTICE
THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES THAT ARE IMPORTANT FOR PROTECTION FROM CHAUNCE FIRE AND ELECTRICAL SHOCK HAZARDS. WHEN SERVICING, IT IS ESSENTIAL THAT ONLY MANUFACTURER'S SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS DESIGNATED WITH A "Z" IN THE SCHEMATIC.



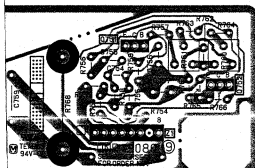
MTG960635A1

Sheet 3 of 4
Side B

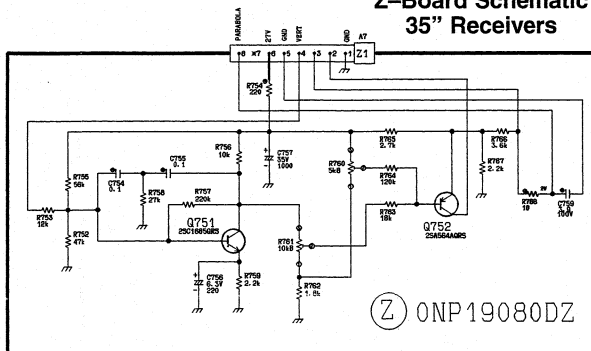
oltage Measurements "Z"-Board

	Q751	Q752
B	3.55	8.79
C	8.24	0.58
E	2.93	9.42

Z-Board 0NP19080 All Receivers



Z-Board Schematic 35" Receivers



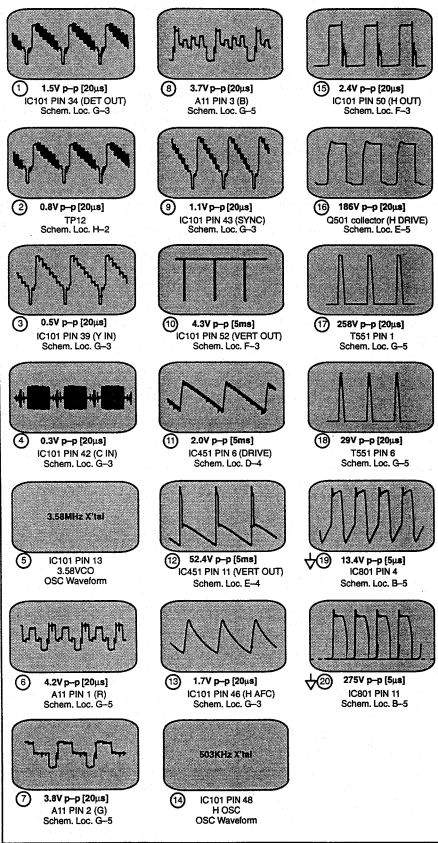
Y-Board Schematic -
All Receivers;
C, R & Z Boards Schematic.
Layout & Voltages - 32" Receivers

A

B

C

Waveforms – A-Board



Note
Voltage levels indicated are for
35" Receivers. 32" Receivers
may vary.

Waveform Measurements

- Indicates waveform measurement. (Measurement can be taken at the best accessible location in common to the indicated point.)
 - Taken with a NTSC signal generator connected to the antenna terminal. (NTSC color bar pattern of 8 bars of EIA colors, 100 IRE white and 7.5 IRE black.)
 - Customer Controls (Picture/Audio Menu) are set to Normalize. Volume is set to "MIN".
 - All video and color waveforms are taken with a wideband scope and a
 - Ground symbol (⏏) shown on waveform number indicates (Hot) ground lead connection of the Oscilloscope. **CAUTION:** Incorrect ground connection of the test equipment will result in erroneous readings.
- The waveforms are taken in the order of circuit flow through the various sections as follows:
- VIDEO – Waveforms 1-3
COLOR – Waveforms 4-8
VERTICAL – Waveforms 9-12

Tu

Enable, Data, a
signals from the
NOTE: Voltage
Refer
TV/CA
Voltage Rea

-VHF

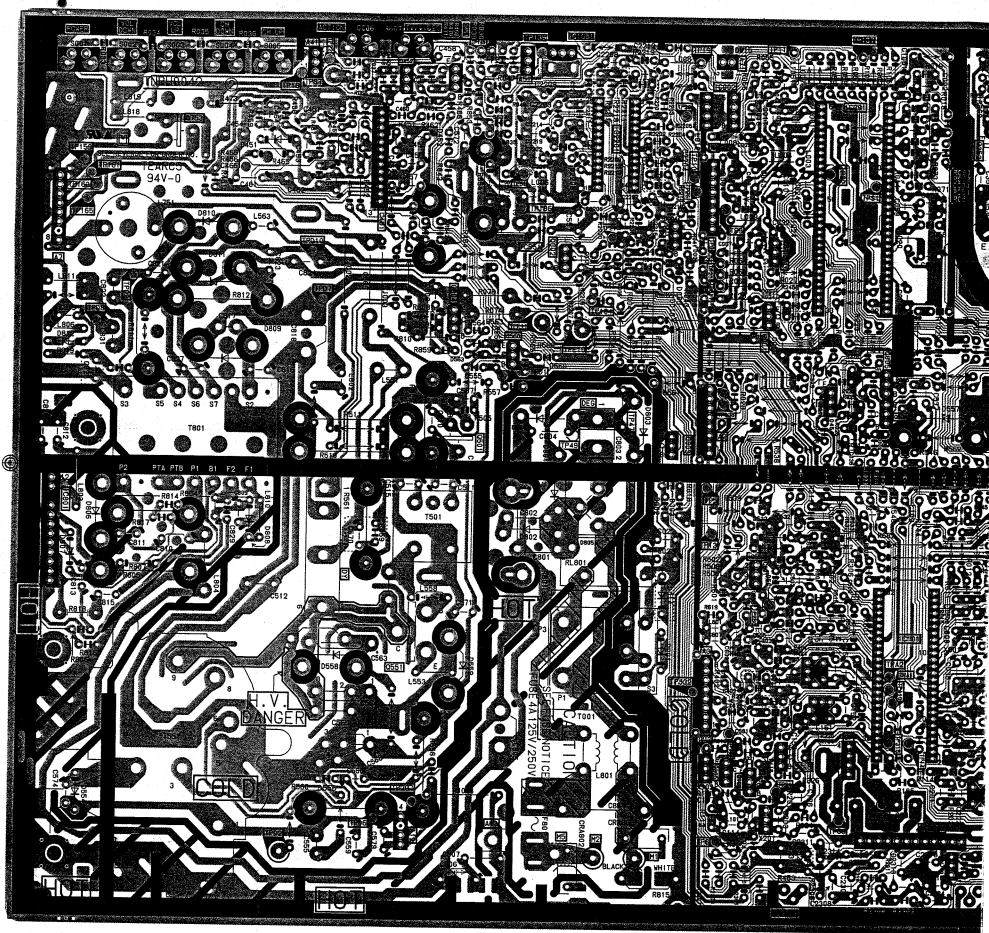
Ch. 02

C

D

E

A-Board TNPH0042 All Receivers



Tuner Voltage Chart

Enable, Data, and Clock have no DC readings. They are digital signals from the MPU.

NOTE: Voltage at the 30V test pin varies with channel selection. Refer to chart for sample tuning voltages of TV/CATV(CABLE) channels as shown.

Voltage Reading Are Nominal And May Vary $\pm 15\%$

-VHF-	
Ch. 02	4.0V

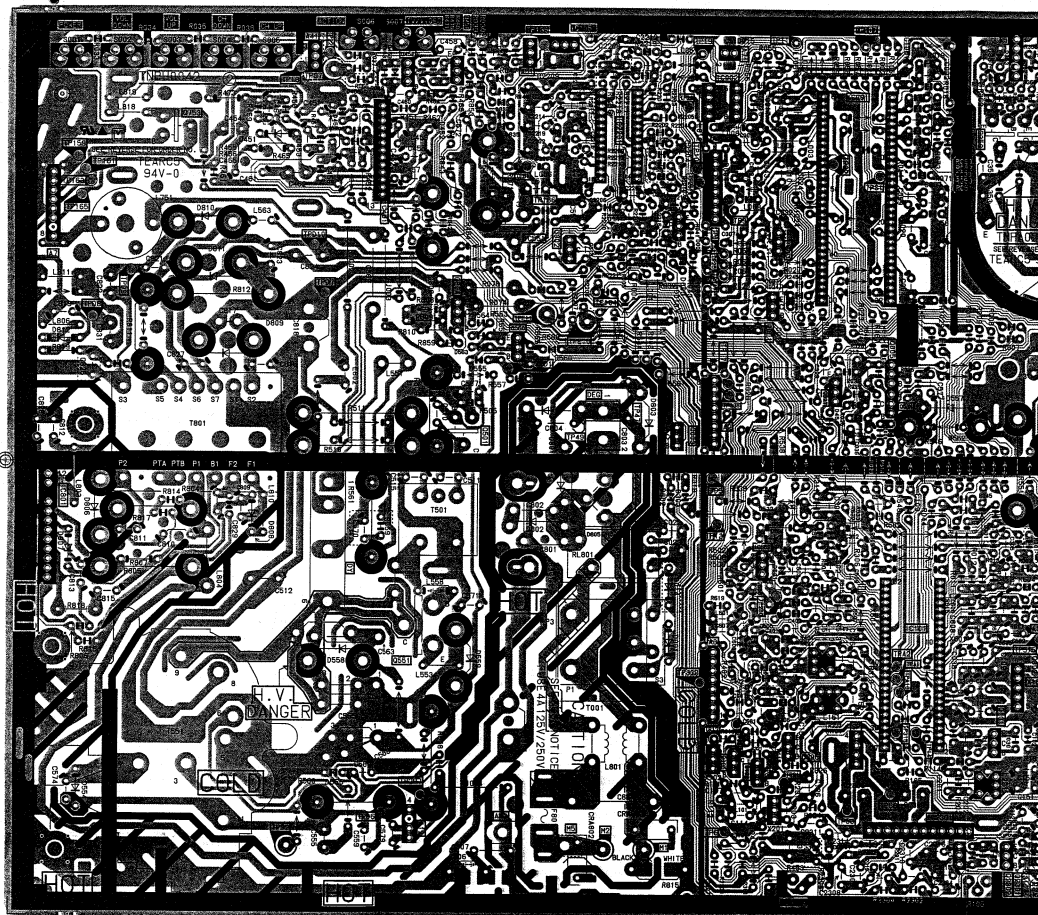
-UHF-	
Ch. 14	7.7V

C

D

E

A-Board TNPH0042 All Receivers

C-Bo
32

Tuner Voltage Chart

Enable, Data, and Clock have no DC readings. They are digital signals from the MPU.

NOTE: Voltage at the 30V test pin varies with channel selection. Refer to chart for sample tuning voltages of TV/CATV(CABLE) channels as shown.

Voltage Reading Are Nominal And May Vary $\pm 15\%$

- VHF -	
Ch. 02	4.0V

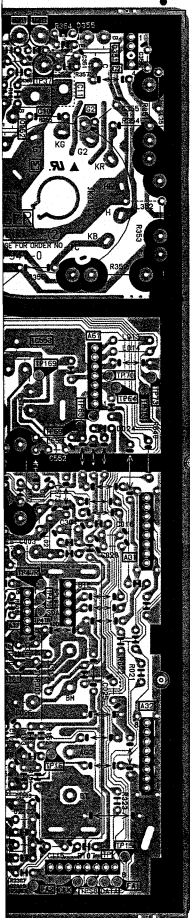
- UHF -	
Ch. 14	7.7V

F

G

H

Card TNPA0203
2" Receivers



Voltage Measurements "A"-Board

IC001			
01	5.17	33	N.C.
02	2.24	34	5.17
03	4.64	35	5.20
04	3.91	36	0.00
05	5.18	37	5.19
06	2.00	38	0.00
07	0.00	39	3.73
08	0.00	40	N.C.
09	N.C.	41	0.00
10	5.19	42	0.00
11	1.29	43	0.00
12	0.00	44	0.00
13	N.C.	45	0.13
14	3.06	46	0.00
15	2.76	47	0.00
16	3.00	48	0.00
17	0.00	49	0.00
18	N.C.	50	N.C.
19	N.C.	51	N.C.
20	N.C.	52	0.00
21	N.C.	53	0.00
22	5.20	54	5.15
23	0.00	55	4.11
24	N.C.	56	N.C.
25	1.28	57	N.C.
26	1.88	58	N.C.
27	0.00	59	4.21
28	N.C.	60	4.26
29	N.C.	61	5.20
30	N.C.	62	2.50
31	5.14	63	2.51
32	N.C.	64	0.00

IC101			
01	2.52	27	2.67
02	1.73	28	0.00
03	3.36	29	2.74
04	0.00	30	8.82
05	0.00	31	4.94
06	0.00	32	2.89
07	0.00	33	N.C.
08	5.63	34	2.87
09	2.76	35	1.77
10	2.67	36	2.97
11	2.77	37	2.98
12	8.82	38	5.01
13	2.62	39	3.85
14	5.92	40	2.61
15	4.21	41	0.00
16	4.24	42	2.43
17	4.99	43	1.98
18	2.97	44	0.29
19	2.98	45	6.19
20	0.00	46	2.64
21	0.00	47	4.28
22	2.89	48	2.15
23	1.37	49	2.83
24	2.73	50	0.89
25	4.66	51	5.93
26	4.07	52	4.11

IC551	
01	16.72
02	0.00
03	8.96

IC553	
01	15.21
02	0.00
03	5.02

**** WARNING**
CRT shuts off when probing pin. Shut Receiver off and turn back on to continue testing

IC002	
01	0.00
02	0.00
03	0.00
04	0.00
05	4.20
06	4.25
07	0.00
08	5.19

IC552	
01	16.32
02	11.99
03	0.00

IC451	
01	12.29
02	4.11
03	6.21
04	0.00
05	6.25
06	5.82
07	25.6
08	1.74
09	N.C.
10	0.00
11	15.54
12	25.9
13	5.21

IC2201			
01	0.00	15	3.82
02	4.21	16	4.45
03	4.25	17	4.52
04	2.11	18	4.55
05	0.00	19	0.65
06	5.86	20	4.65
07	2.71	21	0.00
08	3.88	22	4.62
09	N.C.	23	0.63
10	4.47	24	4.52
11	4.48	25	4.31
12	4.34	26	4.54
13	3.20	27	5.15
14	4.47	28	5.46

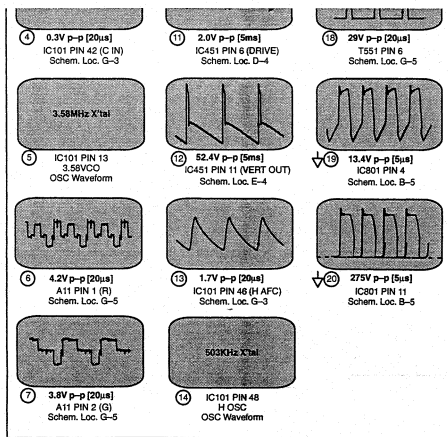
IC2301	
01	1.26
02	0.00
03	17.83
04	0.00
05	0.00
06	1.25
07	9.40
08	17.00
09	0.00
10	18.08
11	17.00
12	9.40

IC801	
01	-39.3
02	-32.6
03	0.00
04	0.25
05	N.C.
06	1.78
07	-0.35
08	0.21
09	0.21
10	N.C.
11	136.0
12	135.9

	Q001	Q002	Q003	Q004	Q005	Q101	Q103	Q305	Q306
B	5.18	5.82	0.75	4.96	-0.41	0.00	2.86	1.42	4.94
C	0.00	12.62	0.10	5.77	3.73	2.72	8.82	0.00	8.82
E	5.17	5.20	0.00	5.82	0.00	0.00	2.24	2.12	4.31

	Q307	Q451	Q452	Q501	Q551	Q753	Q2301	Q2302
B	4.27	0.00	0.16	0.31	-0.10	0.57	0.06	17.81
C	8.84	2.52	0.11	101.3	131.4	9.09	17.82	0.00
E	3.64	0.00	0.00	0.00	0.00	0.00	0.00	17.82

Note



Note
Voltage levels indicated are for
35" Receivers. 32" Receivers
may vary.

Waveform Measurements

- Indicates waveform measurement. (Measurement can be taken at the best accessible location in common to the indicated point.)
- Taken with a NTSC signal generator connected to the antenna terminal. (NTSC color bar pattern of 8 bars of EIA colors, 100 IRE white and 7.5 IRE black.)
- Customer Controls (Picture/Audio Menu) are set to Normalize. Volume is set to MIN.
- All video and color waveforms are taken with a wideband scope and a probe with low capacitance (10 to 1). Shape and peak amplitudes may vary depending on the type of Oscilloscope used and its settings.
- Ground symbol $\downarrow$ shown on waveform number indicates (Hot) ground lead connection of the Oscilloscope. **CAUTION:** Incorrect ground connection of the test equipment will result in erroneous readings.

The waveforms are taken in the order of circuit flow through the various sections as follows:

VIDEO - Waveforms 1-3
COLOR - Waveforms 4-8
VERTICAL - Waveforms 9-12
HORIZONTAL - Waveforms 13-16
CRT DRIVE - Waveforms 17 & 18
POWER SUPPLY - Waveforms 19-20

Schematic Notes

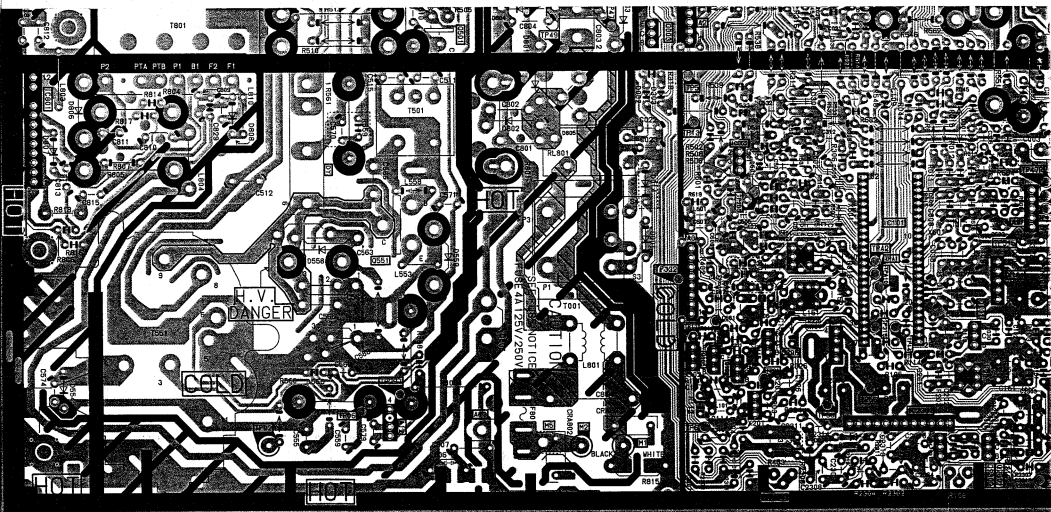
- Resistors are carbon 1/4W unless noted otherwise.
- Capacitors are ceramic 50V unless noted otherwise.
- Coil value noted is inductance in μ H.
- Test point indicated by $\bullet$. Test point but no pin $\circ$.
- Components indicated with $\triangle$ are critical parts and replacement should be made with manufacturer specified replacement parts only.
- (BOLD LINE)** indicates the route of B+ supply.
- The schematic diagrams are current at the time of printing and are subject to change without notice.
- Ground symbol $\downarrow$ indicates HOT GROUND CONNECTION. ∇ indicates COLD GROUND.

NOTE: All other component symbols are used for engineering design purposes.

Voltage Measurements

- Voltage measurement:
 - AC input to the Receiver is 120V. NTSC generator is connected to the antenna of the Receiver. (Color bar pattern of 100IRE white and 7.5IRE black)
 - All Picture and Audio adjustments are set to Normalize. TV ANT/CABLE - (Set-Up Menu) in TV/ANT Mode. Volume - Min. TV/Video SW - TV position.
- Audio Mode - Stereo.
 - Voltage readings are nominal and may vary $\pm 10\%$ on active devices. Some voltage reading will vary with signal strength and picture content.
 - Supply voltages are all nominal.

Ground symbol $\downarrow$ indicates ground lead connection of meter. **Caution:** Incorrect ground connection will result in erroneous readings.



Tuner Voltage Chart

Enable, Data, and Clock have no DC readings. They are digital signals from the MPU.

NOTE: Voltage at the 30V test pin varies with channel selection. Refer to chart for sample tuning voltages of TV/CATV(CABLE) channels as shown.

Voltage Reading Are Nominal And May Vary $\pm 15\%$

- VHF -	
Ch. 02	4.0V
Ch. 06	8.2V
Ch. 07	7.0V
Ch. 13	9.3V

- UHF -	
Ch. 14	7.7V
Ch. 69	24V

- CABLE -					
1st Band		2nd Band		3rd Band	
Ch. 1	6.7V	Ch. 16	4.5V	Ch. 47	3.7V
Ch. 15	24.7V	Ch. 46	2.70V	Ch. 94	14.9V
Ch. 95	9.8V			Ch. 100	15.1V
Ch. 99	17.5V			Ch. 125	24.0V

MICROPROCESSOR PROGRAMMING FOR BAND TUNING/SWITCHING

	54MHz	130MHz	360MHz	806MHz
	FIRST TUNING BAND	SECOND TUNING BAND	THIRD TUNING BAND	
VHF	02-06	07-13		
UHF			14-69	
CABLE	01-06,14, 15,95-99	07-13, 16-46	47-94, 100-125	

NOTE: CABLE channel numbers as recommended by the Joint EIA/NCTA Engineering Committee and published as EIA INTERIM STANDARD NO. 6 - CABLE TELEVISION CHANNEL IDENTIFICATION PLAN - MAY 1983.

IMPORTANT SAFETY NOTICE

THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL SAFETY FEATURES TO PROTECT YOU FROM ELECTRICAL SHOCK HAZARDS WHEN SERVICING THIS EQUIPMENT. ONLY QUALIFIED PERSONNEL SHOULD BE PERMITTED TO SERVICER THE EQUIPMENT. ALWAYS DISCONNECT THE EQUIPMENT FROM THE AC POWER SUPPLY BEFORE ATTEMPTING TO SERVICER THE EQUIPMENT.

Board Index

- "A" Board - Main Chassis
- "C" Board - CRT Board
- "L" Board - Receiver Controls & Remote
- "R" Board - Remote Receiver
- "S" Board - Tuner (Second)
- "X" Board - A/V, S-Video, TV Switching
- "Y" Board - PIP Processing
- "Z" Board - Pincushion Correction

C

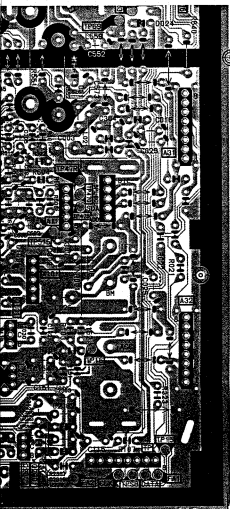
T



Voltage Measurements – "Y" –

	ICT
01	0.41
02	0.56
03	0.00
04	0.42
05	0.36
06	0.00
07	0.01
08	0.36
09	0.36
10	4.95

Y



30	N.C	62**	2.50
31	5.14	63	2.51
32	N.C	64	0.00

01	16.72
02	0.00
03	8.96

01	15.21
02	0.00
03	5.02

**** WARNING**
CRT shuts off when probing pin. Shut Receiver off and turn back on to continue testing

IC002		
01	0.00	
02	0.00	
03	0.00	
04	0.00	
05	4.20	
06	4.25	
07	0.00	
08	5.19	

IC552		
01	16.32	
02	11.99	
03	0.00	

IC451		
01	12.29	
02	4.11	
03	6.21	
04	0.00	
05	6.25	
06	5.82	
07	25.6	
08	1.74	
09	N.C	
10	0.00	
11	15.54	
12	25.9	
13	5.21	

IC2201		
01	0.00	15 3.82
02	4.21	16 4.45
03	4.25	17 4.52
04	2.11	18 4.55
05	0.00	19 0.65
06	5.86	20 4.65
07	2.71	21 0.00
08	8.88	22 4.62
09	N.C	23 0.63
10	4.47	24 4.52
11	4.48	25 4.31
12	4.34	26 4.54
13	3.20	27 5.15
14	4.47	28 5.46

IC2301		
01	1.26	
02	0.00	
03	17.83	
04	0.00	
05	0.00	
06	1.25	
07	9.40	
08	17.00	
09	0.00	
10	18.08	
11	17.00	
12	9.40	

IC801		
01	-39.3	
02	-32.6	
03	0.00	
04	0.25	
05	N.C	
06	1.78	
07	-0.35	
08	0.21	
09	0.21	
10	N.C	
11	136.0	
12	135.9	

	Q001	Q002	Q003	Q004	Q005	Q101	Q103	Q305	Q306
B	5.18	5.82	0.75	4.96	-0.41	0.00	2.86	1.42	4.94
C	0.00	12.62	0.10	5.77	3.73	2.72	8.82	0.00	8.82
E	5.17	5.20	0.00	5.82	0.00	0.00	2.24	2.12	4.31

	Q307	Q451	Q452	Q501	Q551	Q753	Q2301	Q2302
B	4.27	0.00	0.16	0.31	-0.10	0.57	0.06	17.81
C	8.84	2.52	0.11	101.3	131.4	9.09	17.82	0.00
E	3.64	0.00	0.00	0.00	0.00	0.00	0.00	17.82

Note
Voltage levels indicated are for
35" Receivers. 32" Receivers
may vary.

Note: Stereo Models

The Functions listed below are activated by a DC voltage change to DAC Inputs (Pin 5 and 6) of MPU IC001. Press and hold a function button on the Receiver to measure voltages.

FUNCTION	PIN 5	PIN 6
POWER	0V-0.443V	N/A
VOL ◀	0.797V-1.07V	N/A
VOL ▶	1.424V-1.696V	N/A
CH ▼	2.05V-2.323V	N/A
CH ▲	2.677V-2.95V	N/A
TV/VIDEO	3.304V-3.576V	N/A
ACTION	N/A	0V-0.443V

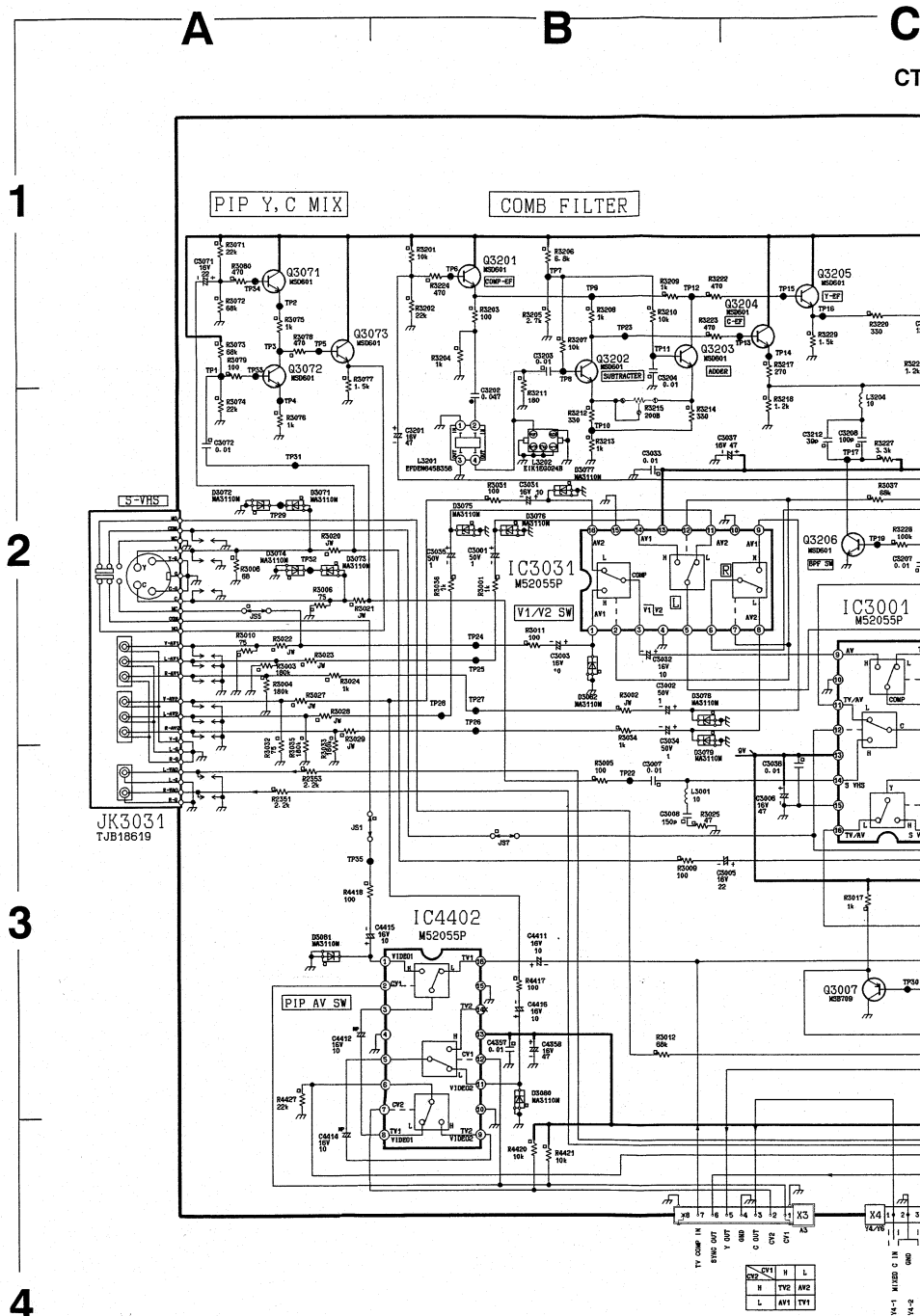
The AUDIO MODES being broadcast are displayed on screen in red by the voltage change to DAC input (Pin 11) of MPU IC001.

AUDIO MODE BROADCAST	PIN 11	
MONO	MN1873265T6E	MN1873265T6F
SAP	4.087V-5.0V	4.244V-5.0V
STEREO	2.207V-3.733V	2.364V-3.89V
STEREO & SAP	0.954V-1.853V	1.11V-2.01
	0V-0.6V	0V-0.756V

& Remote Receiver

Switching, Comb Filter

ction



E

X-Board Schematic

CT-32S20U & CT-35G21U/UU/CU

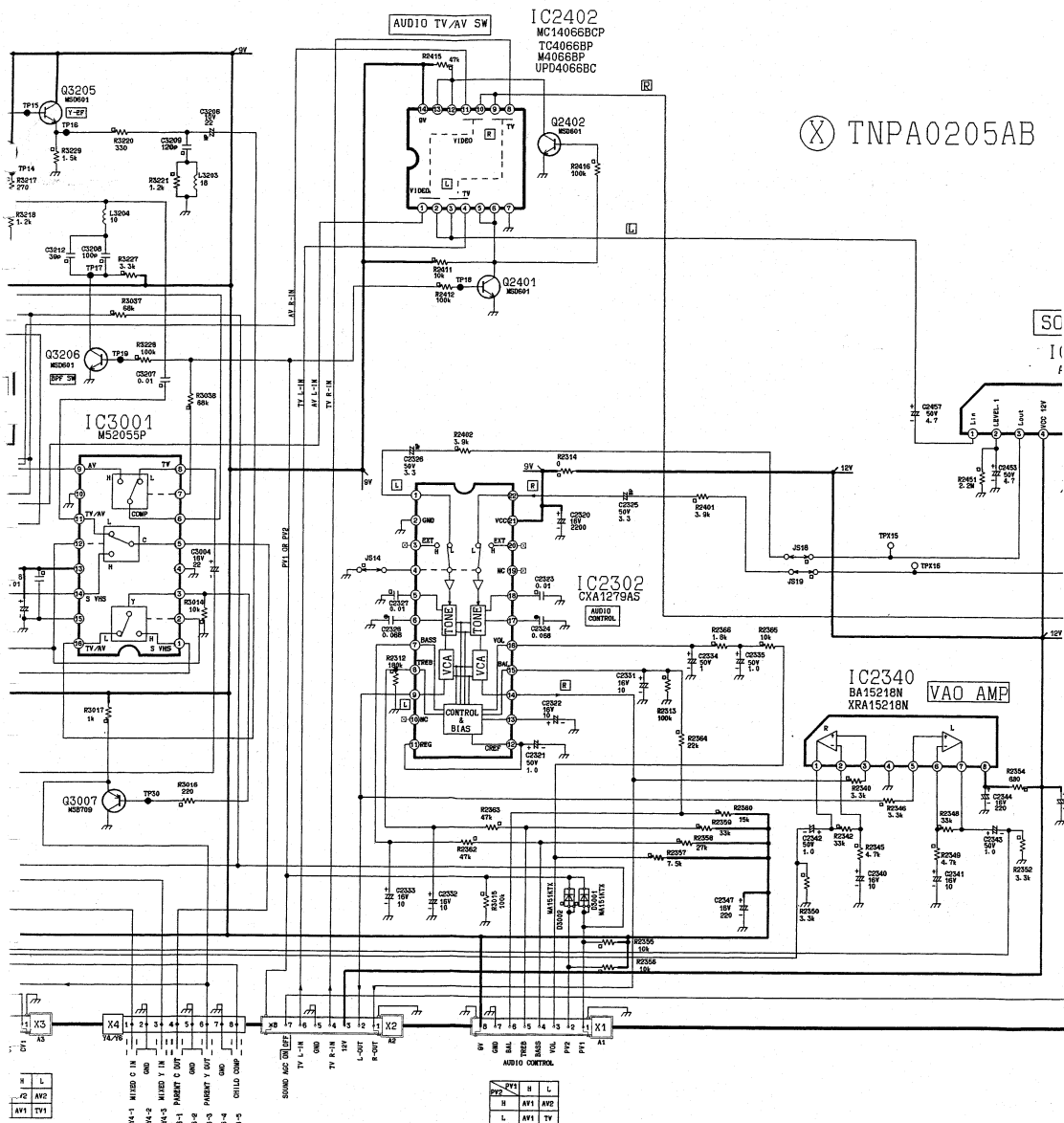


C

D

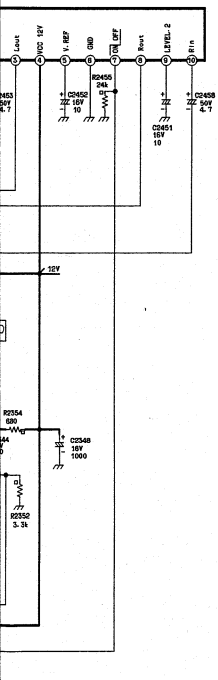
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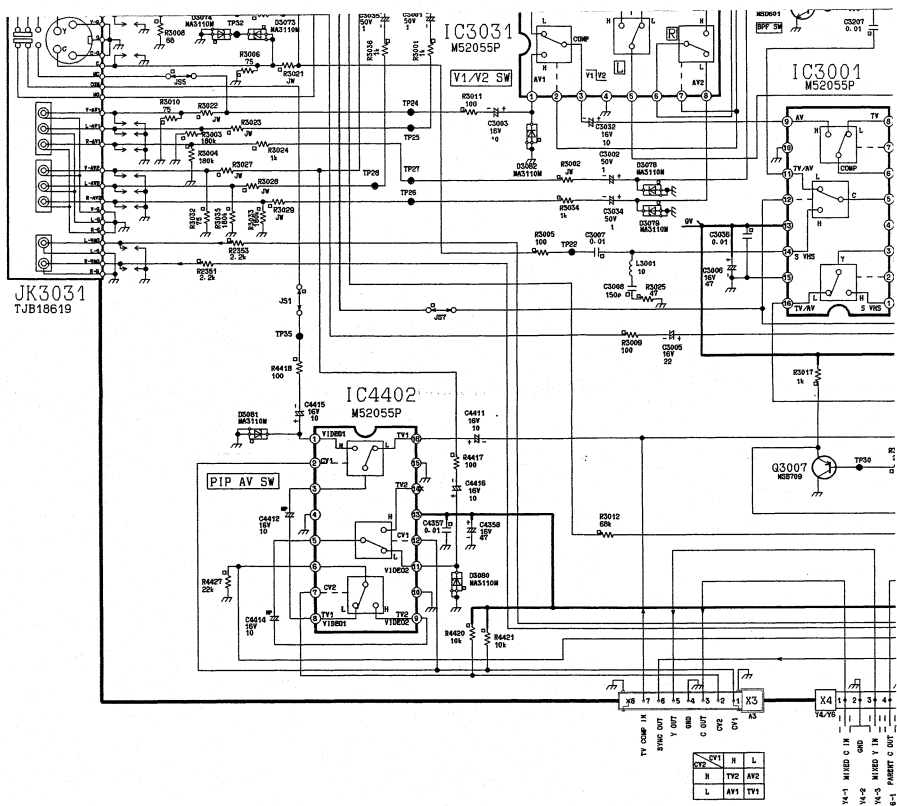
X-Board Schematic CT-32S20U & CT-35G21U/UU/CU



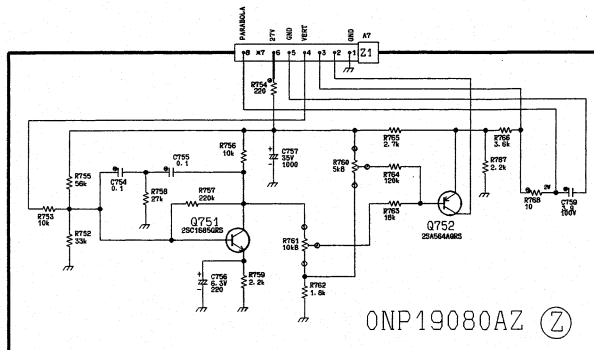
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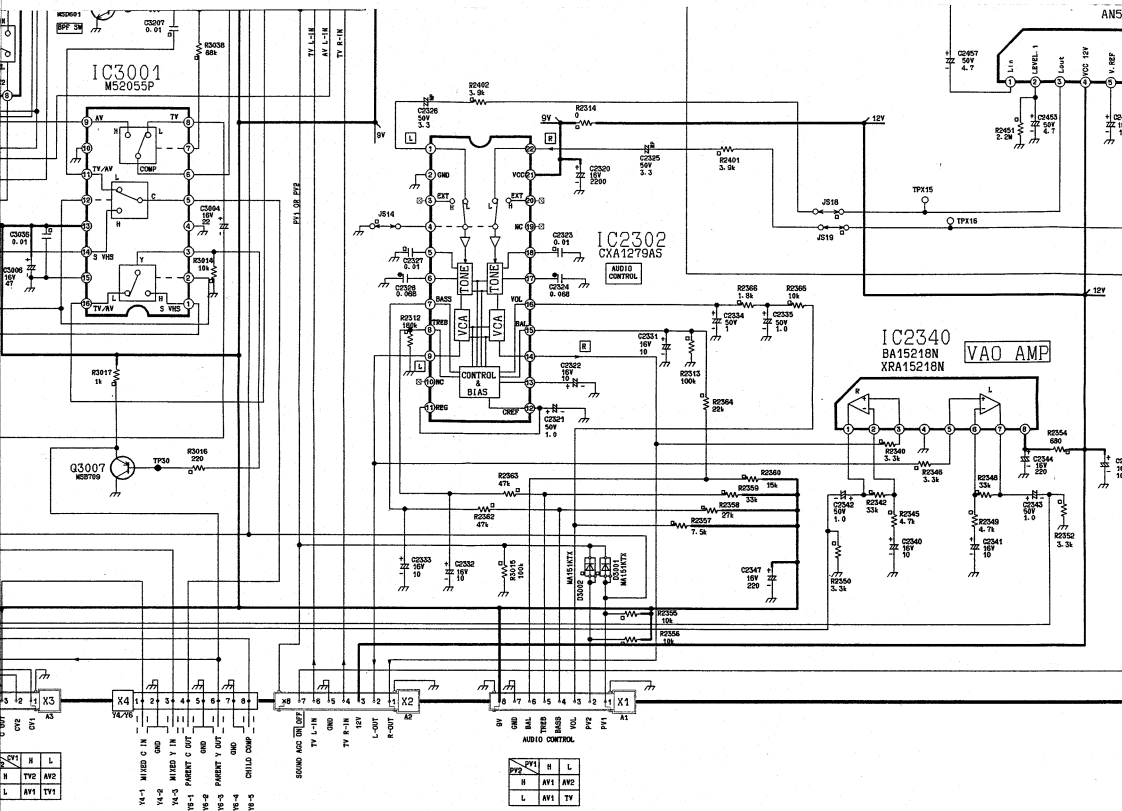
IC2451
AN5285K

[illegible]



Z-Board Schematic 32" Receivers







Ⓡ TNP111805

250V 0.5A

BR1

C1001 100µF

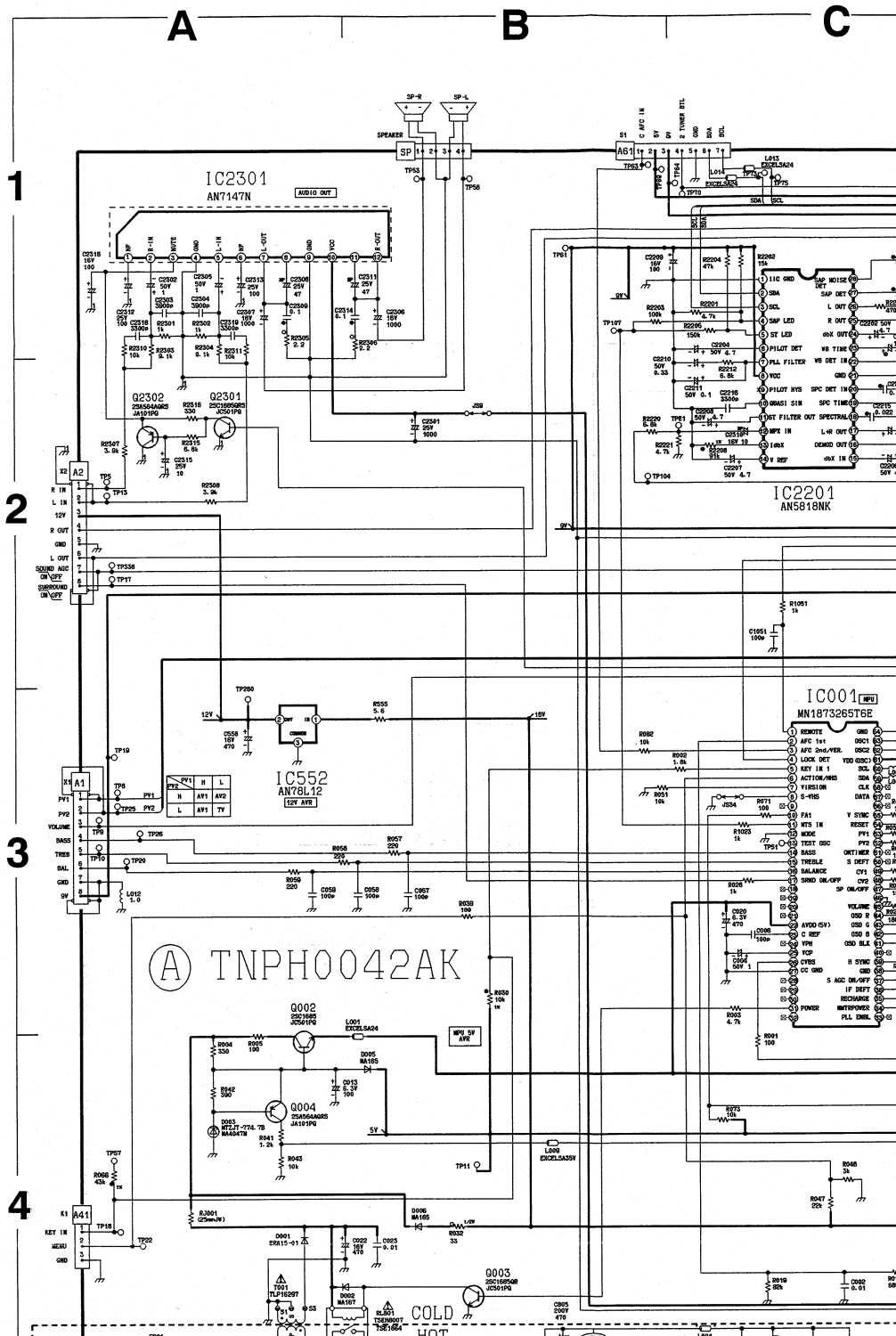
R1001 100V

C1002 0.01µF

250V

R-Bc
34

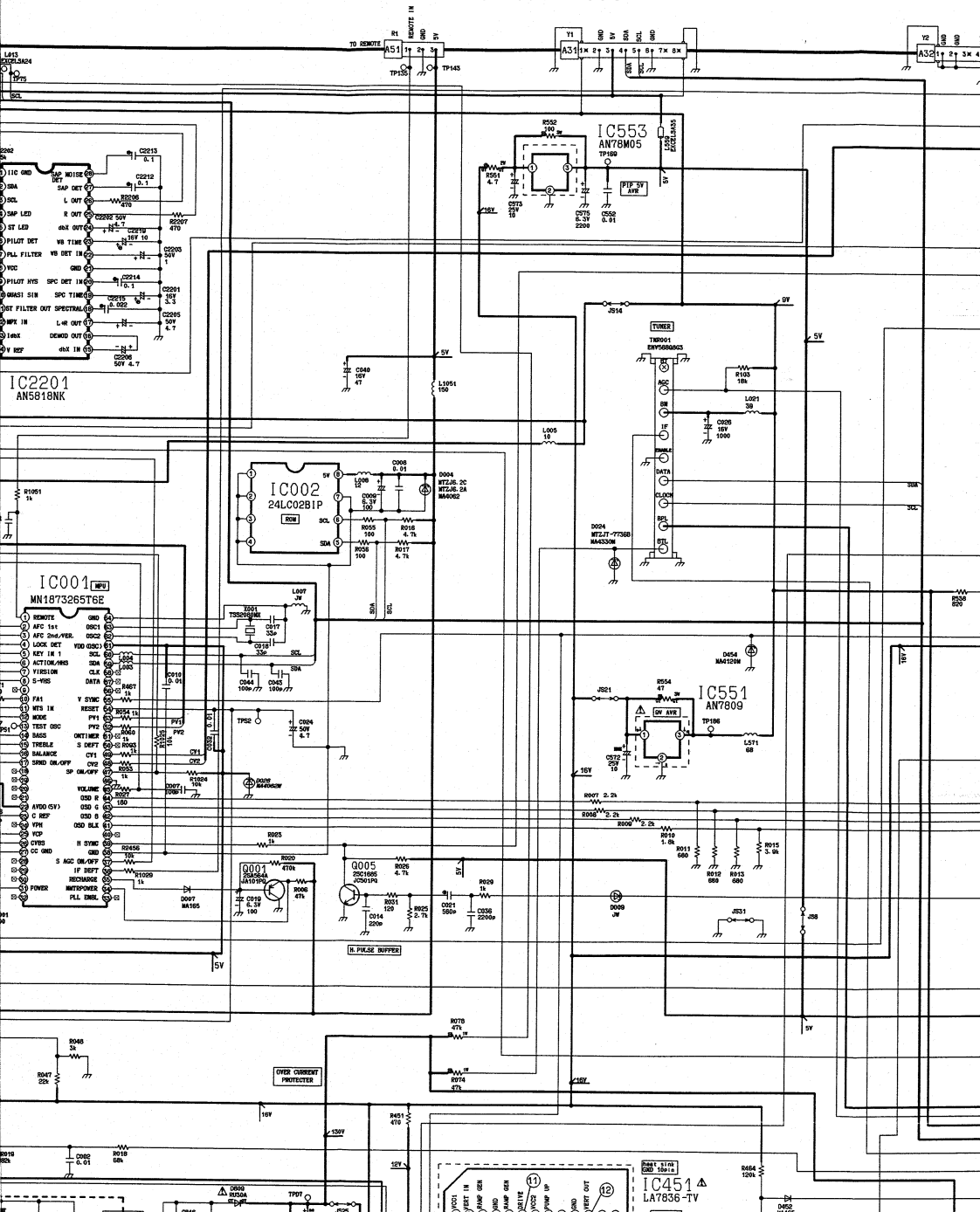




C

D

E

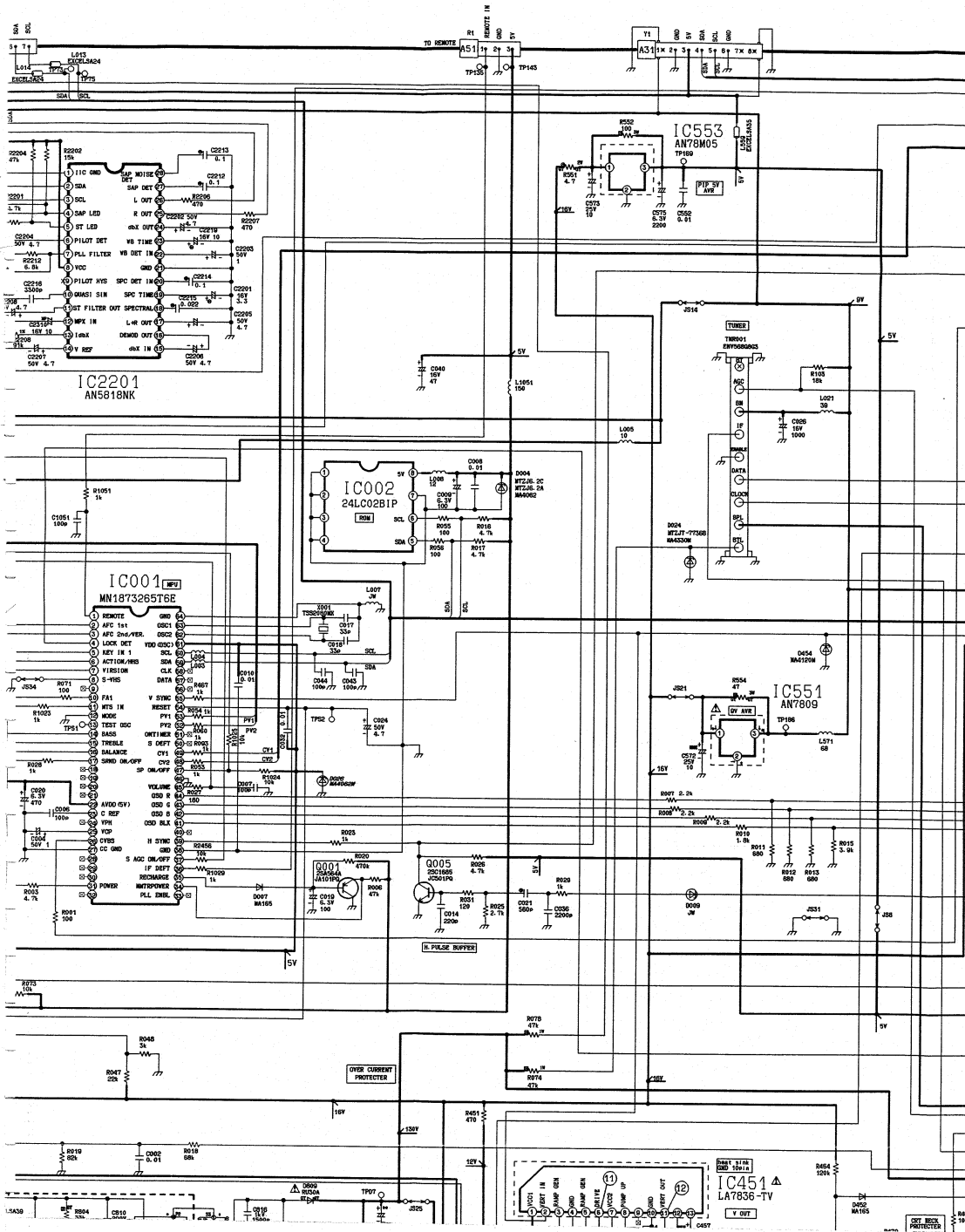
A-Board Schematic
CT-35G31U/UU

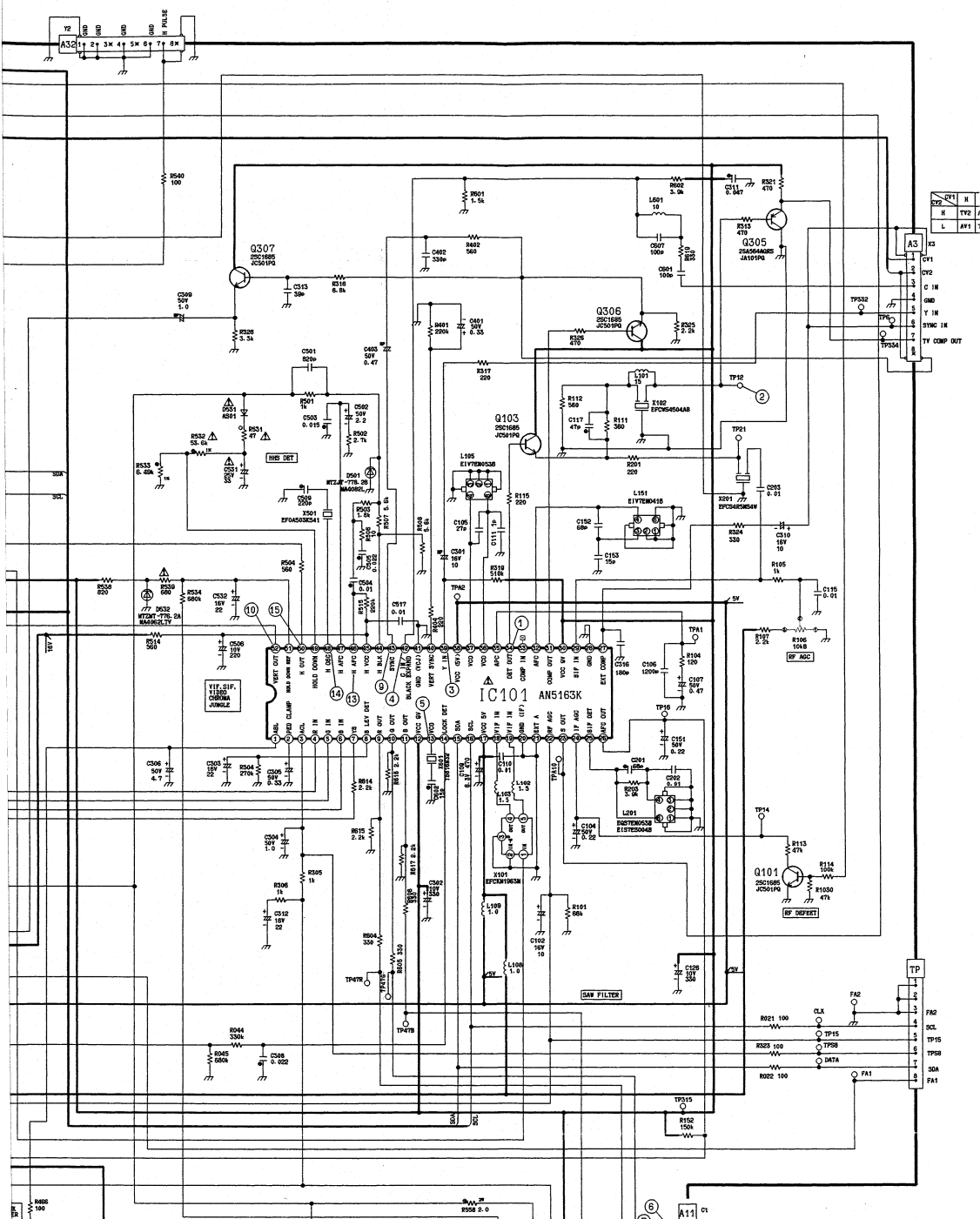
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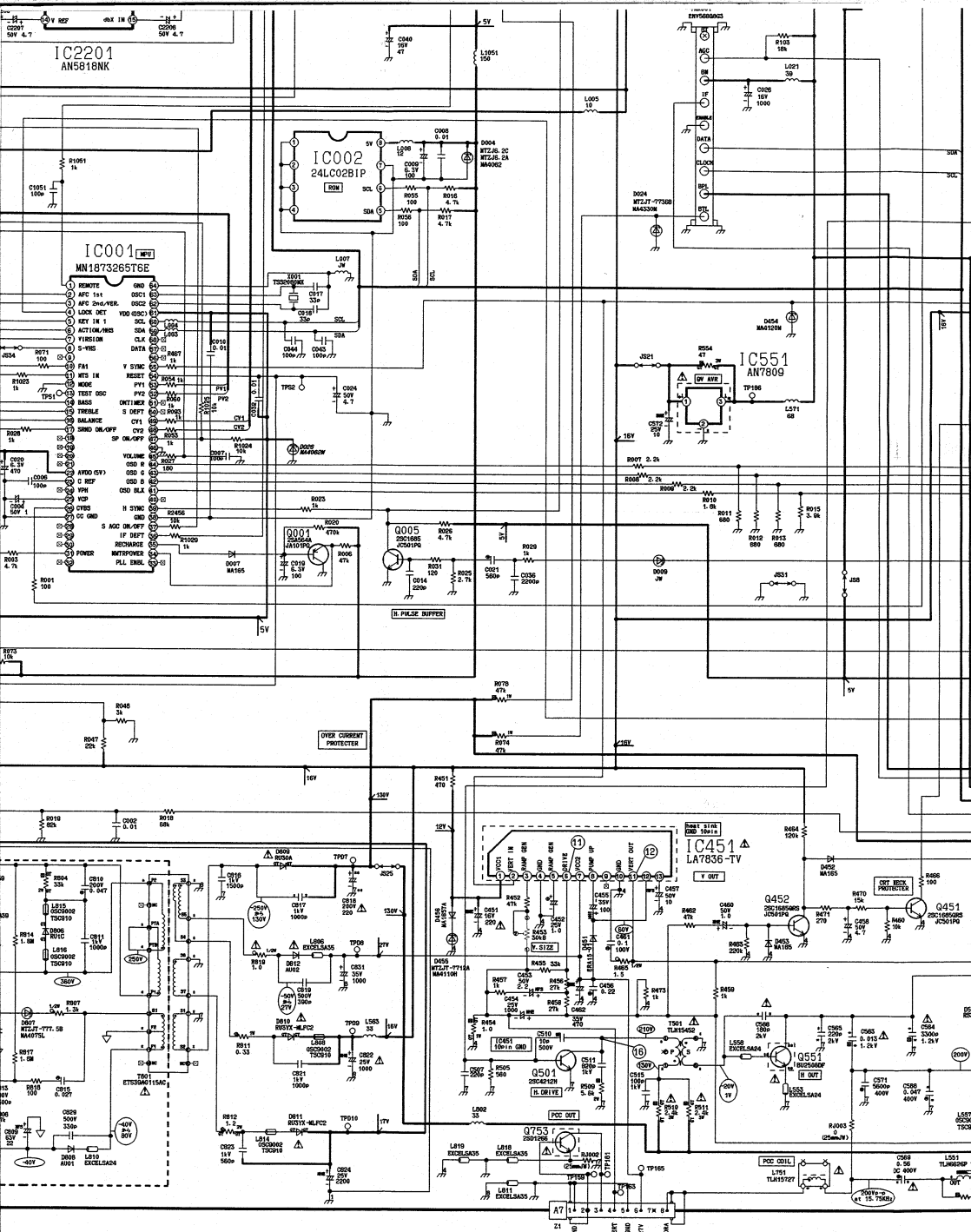
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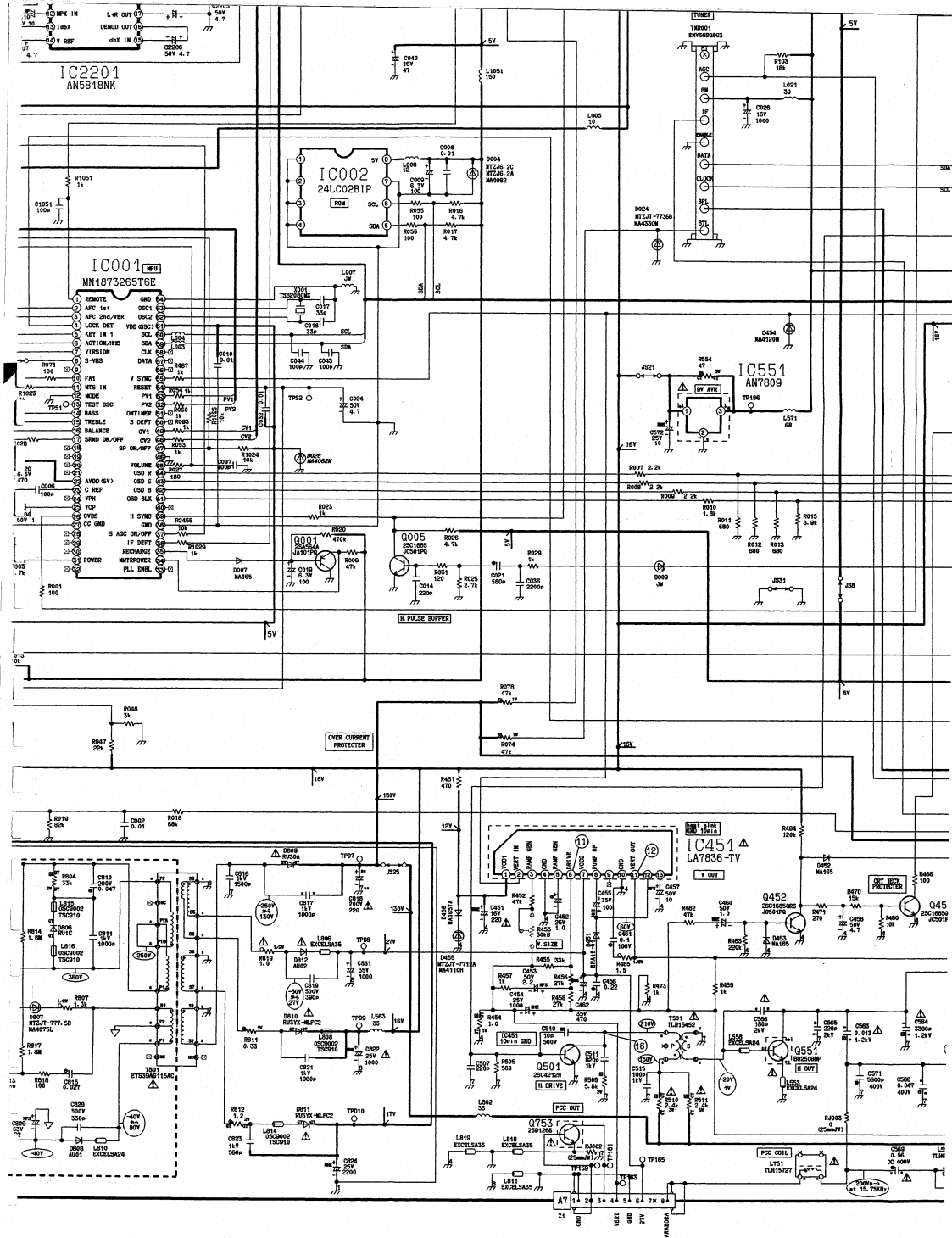
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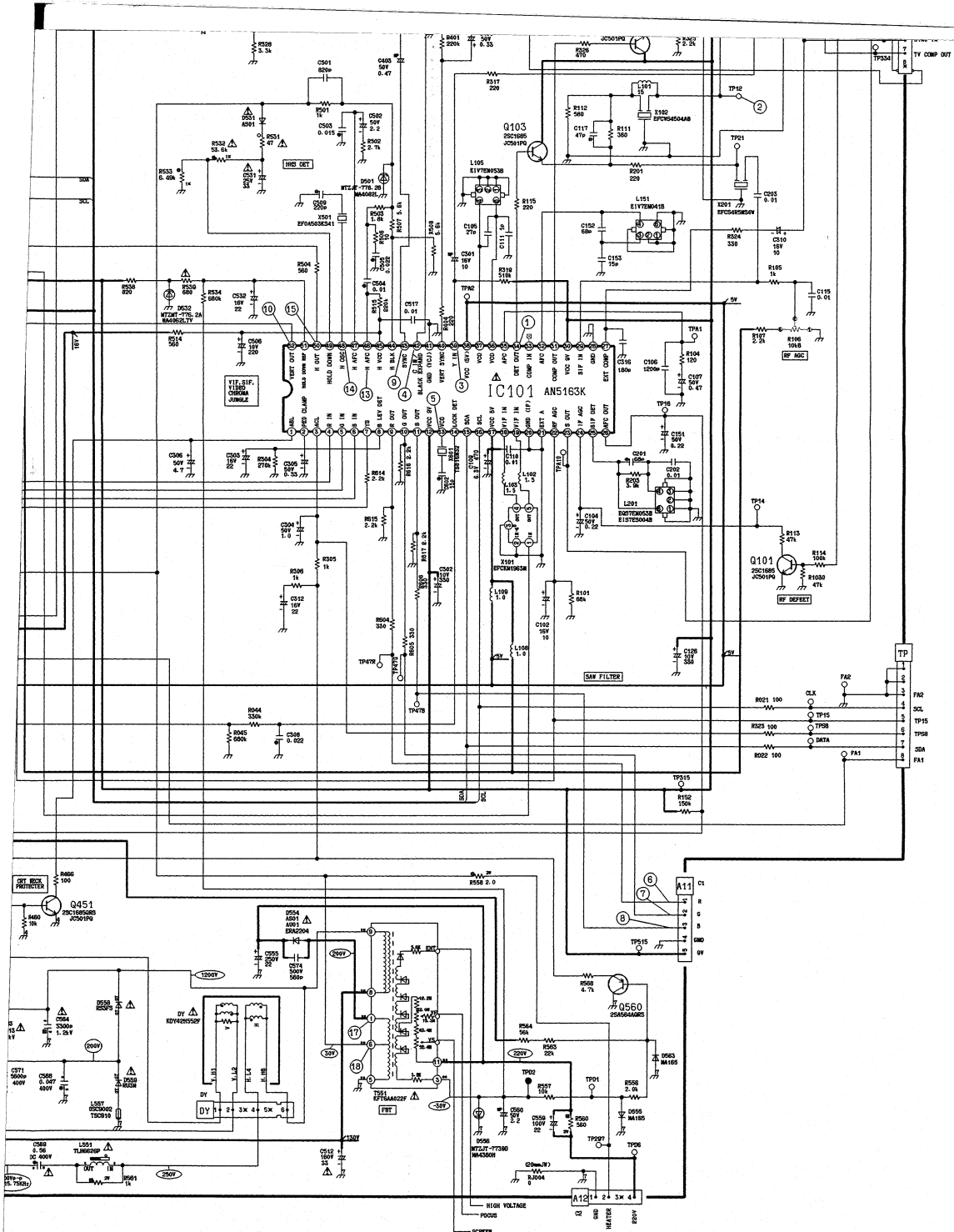
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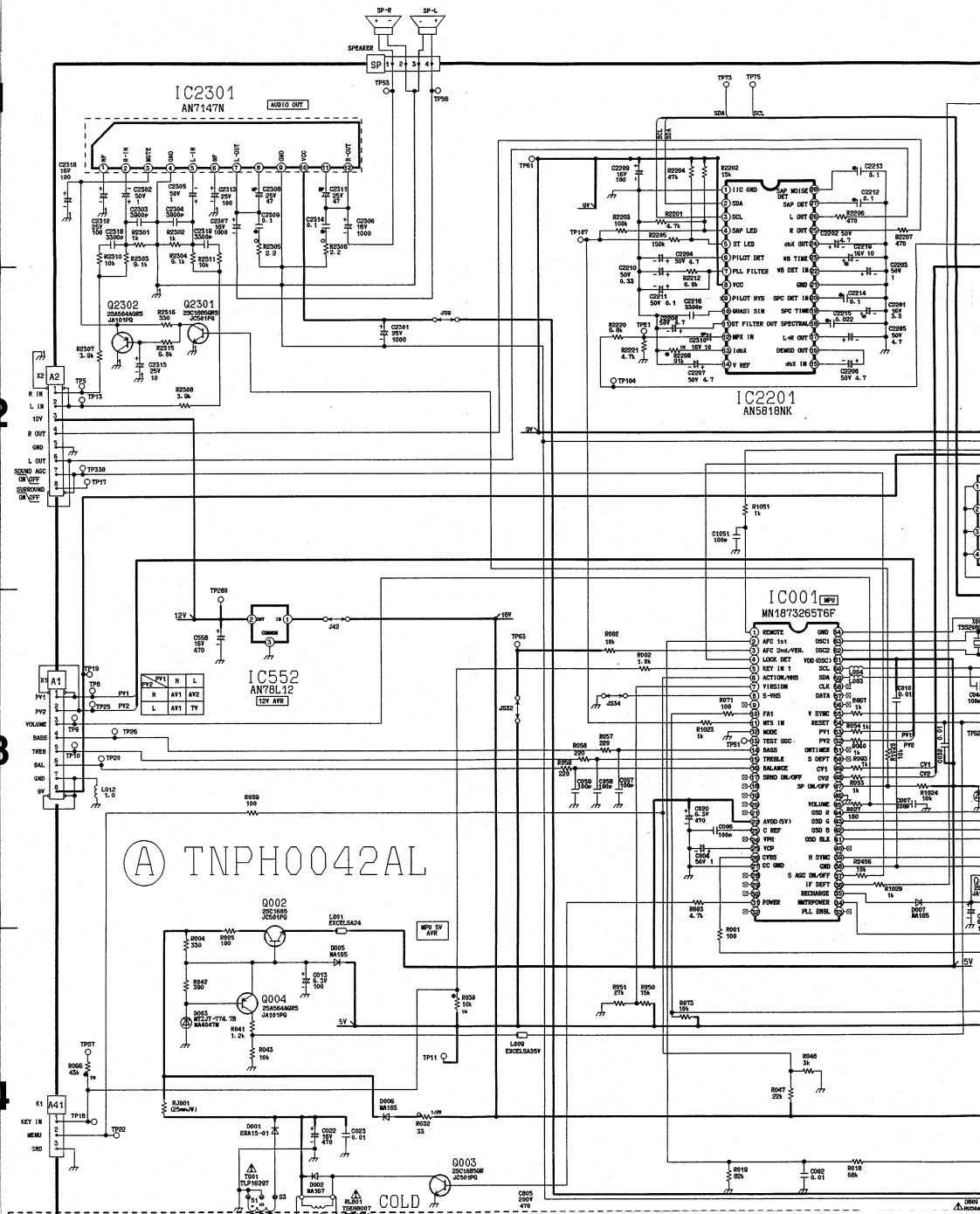




A

B

C

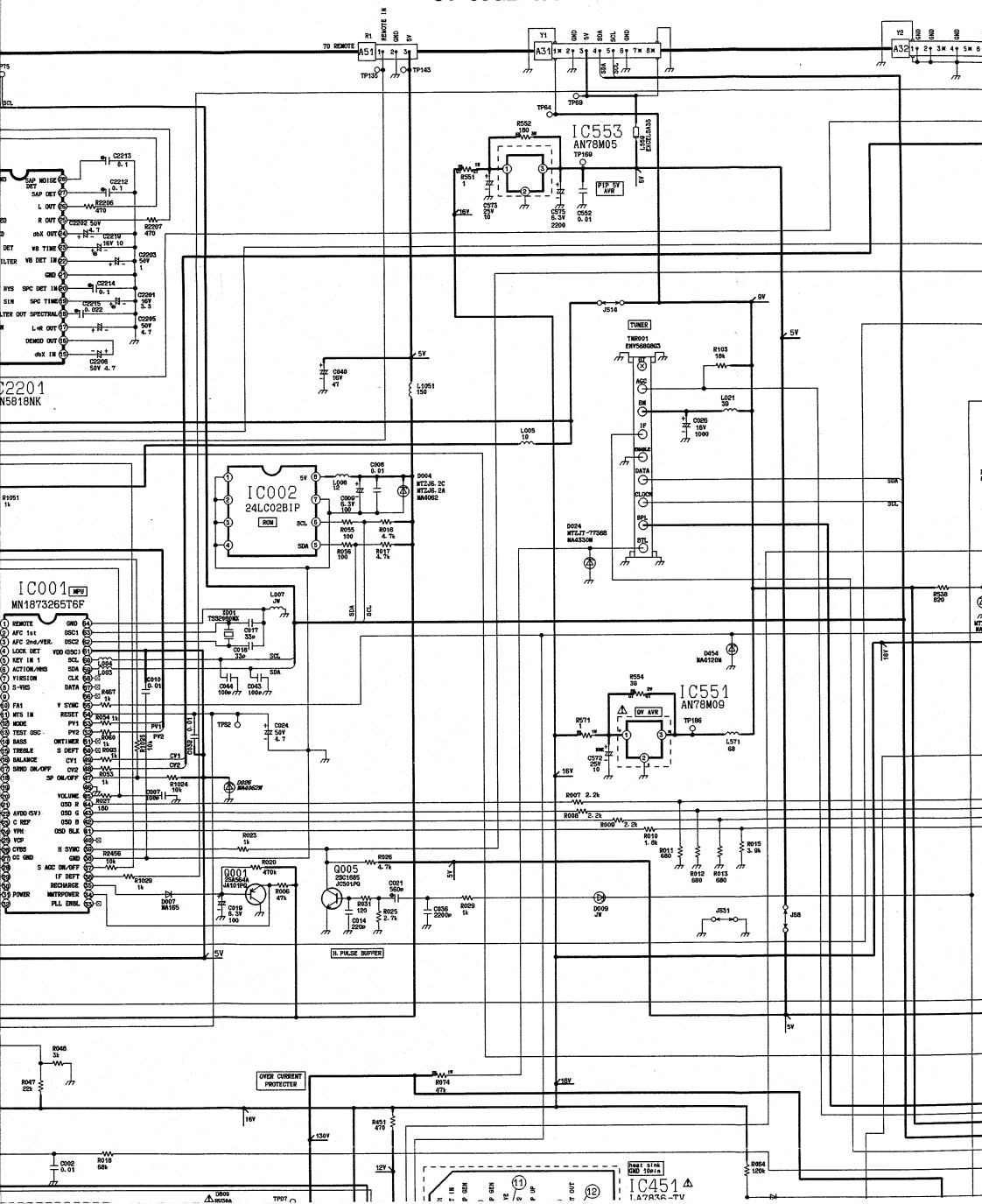


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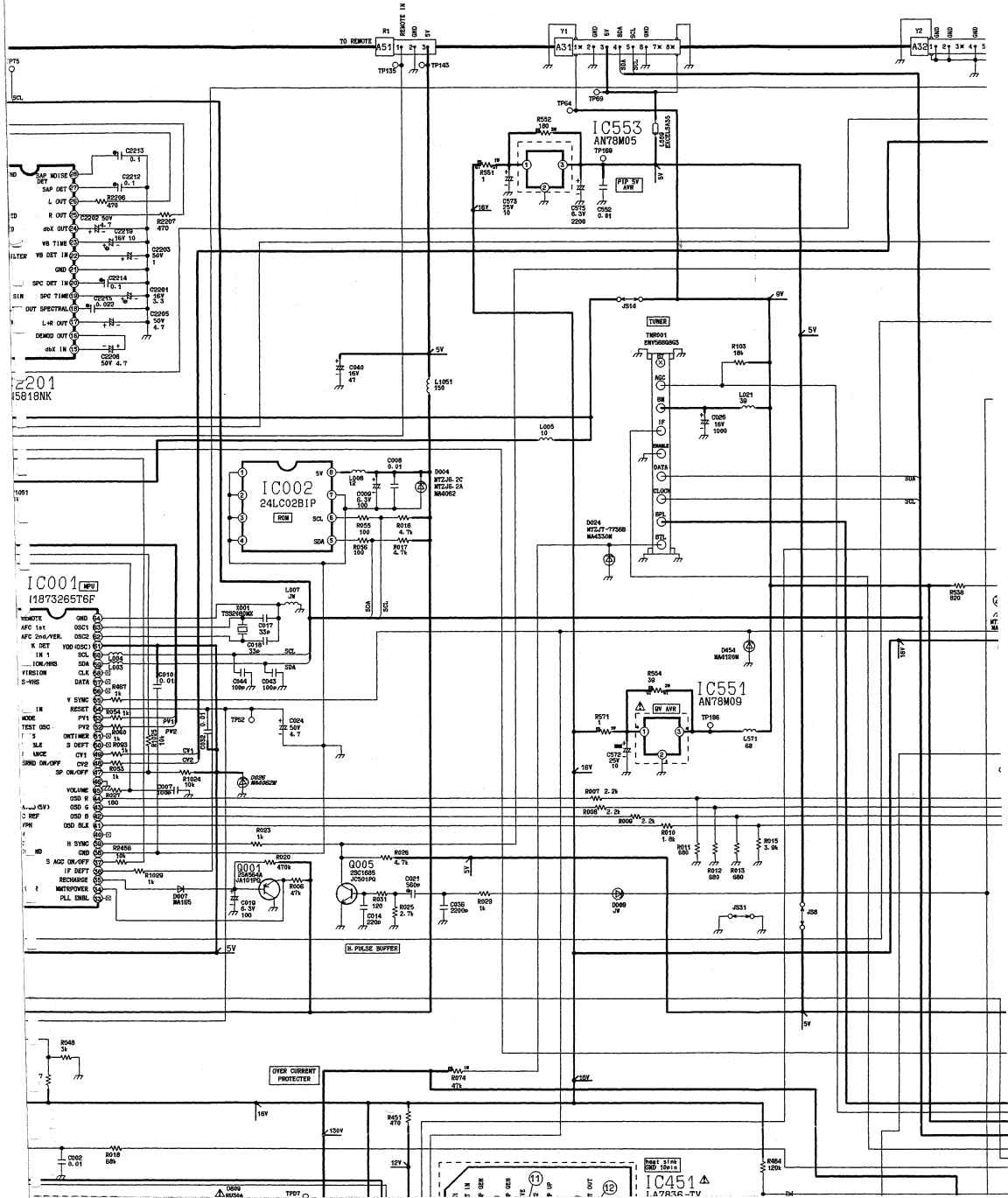
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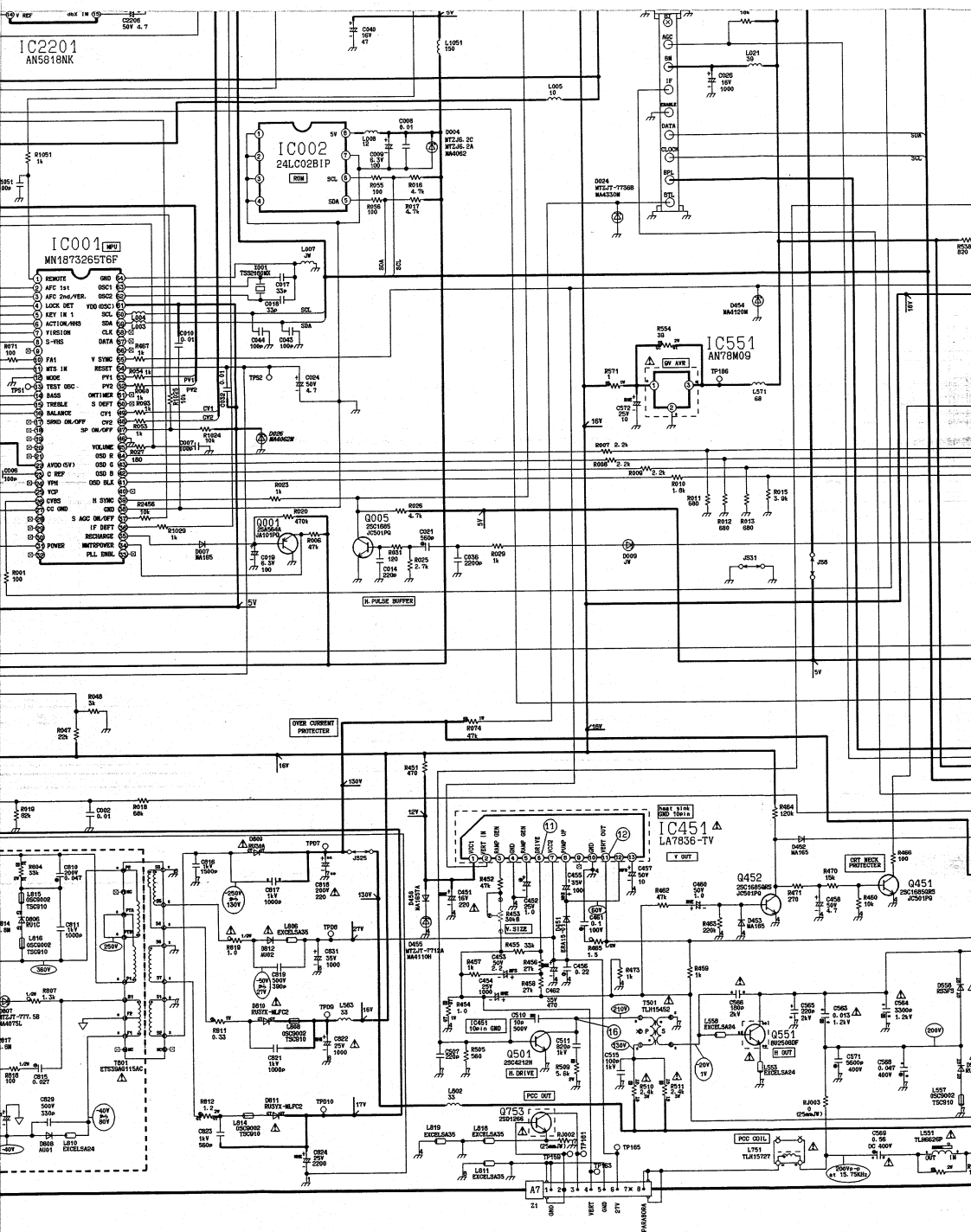
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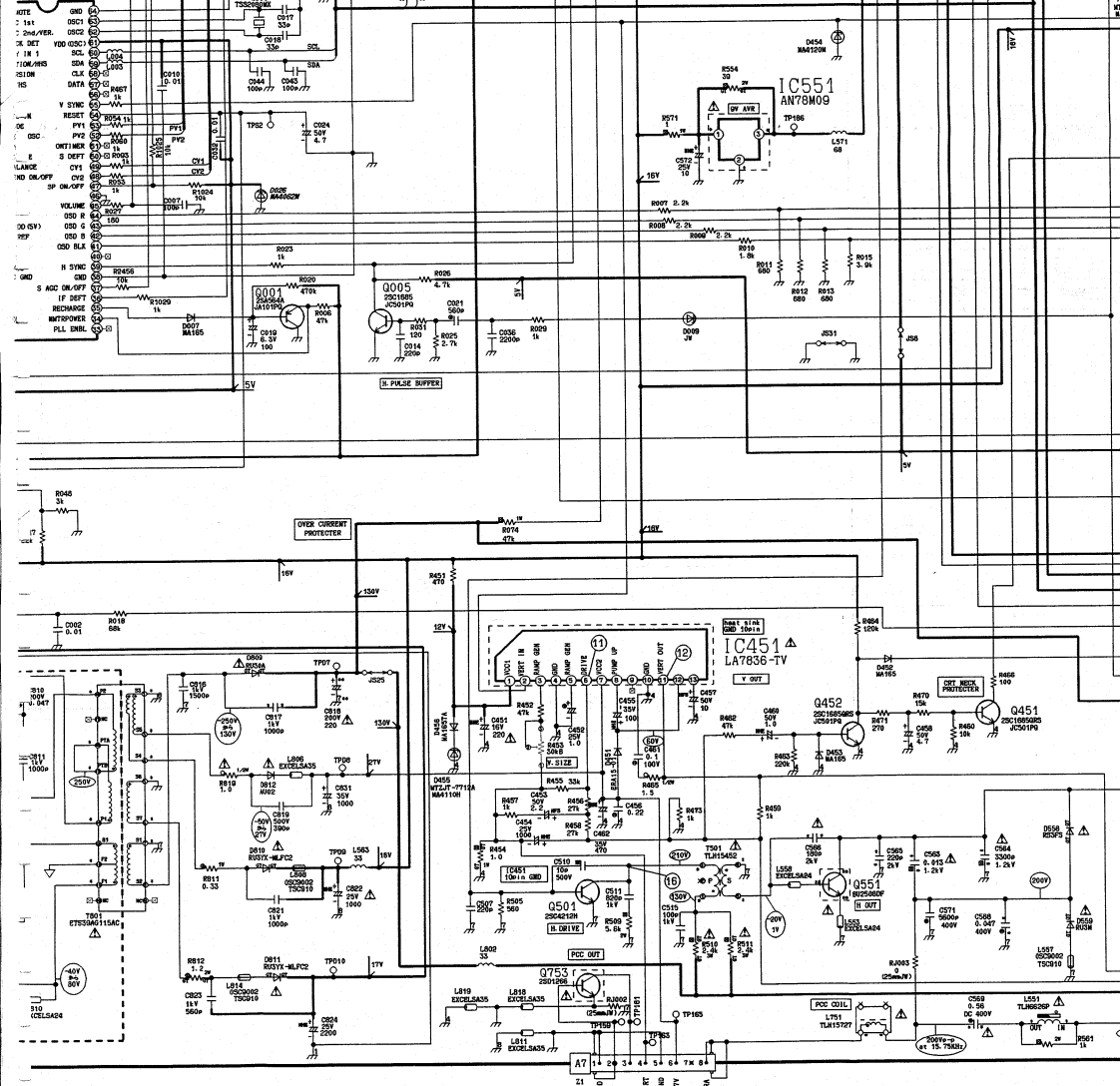
A-Board Schematic CT-35G21U/UU/CU



A-Board Schematic CT-35G21U/UU/CU







TNPH0042

A B C

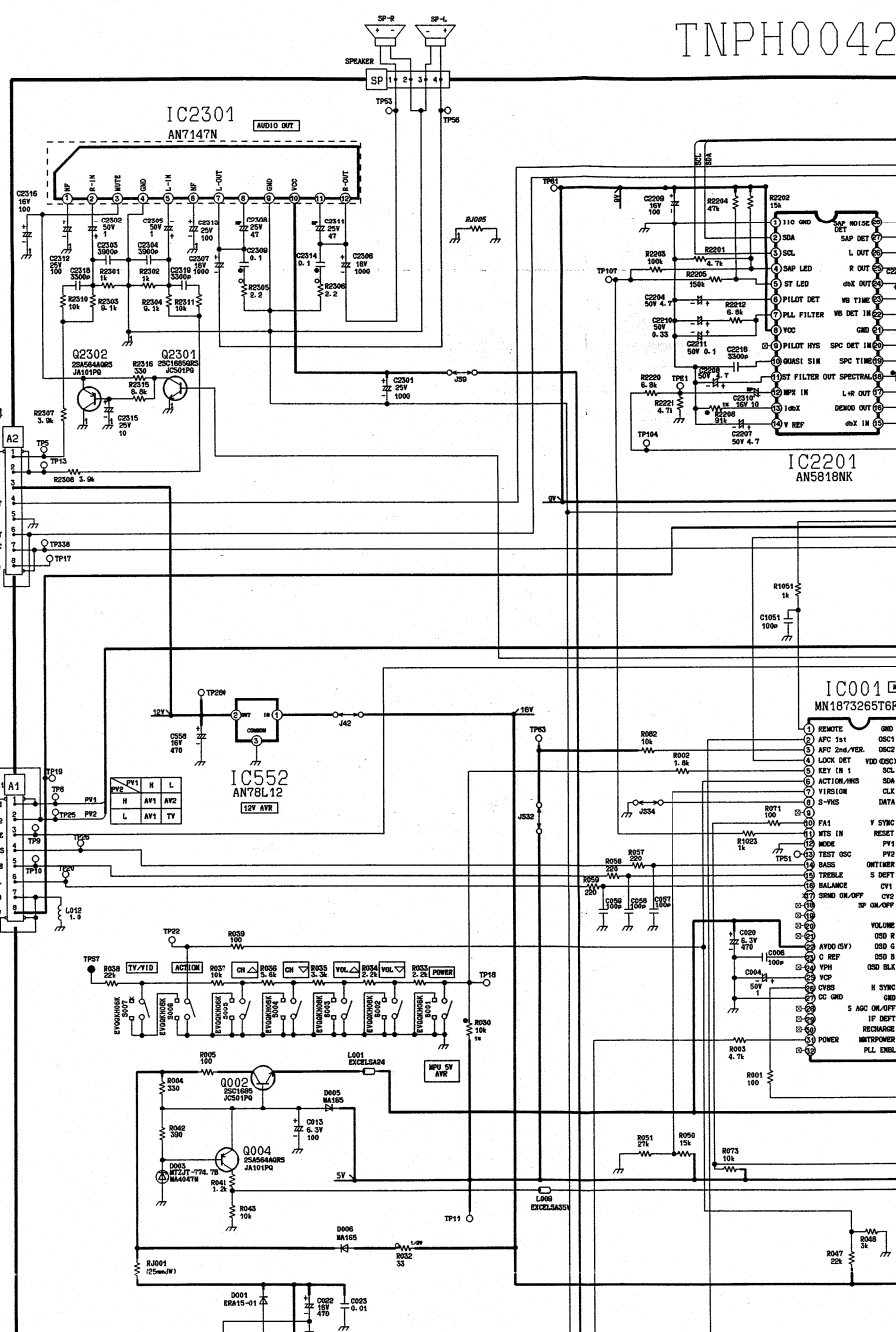
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2

3

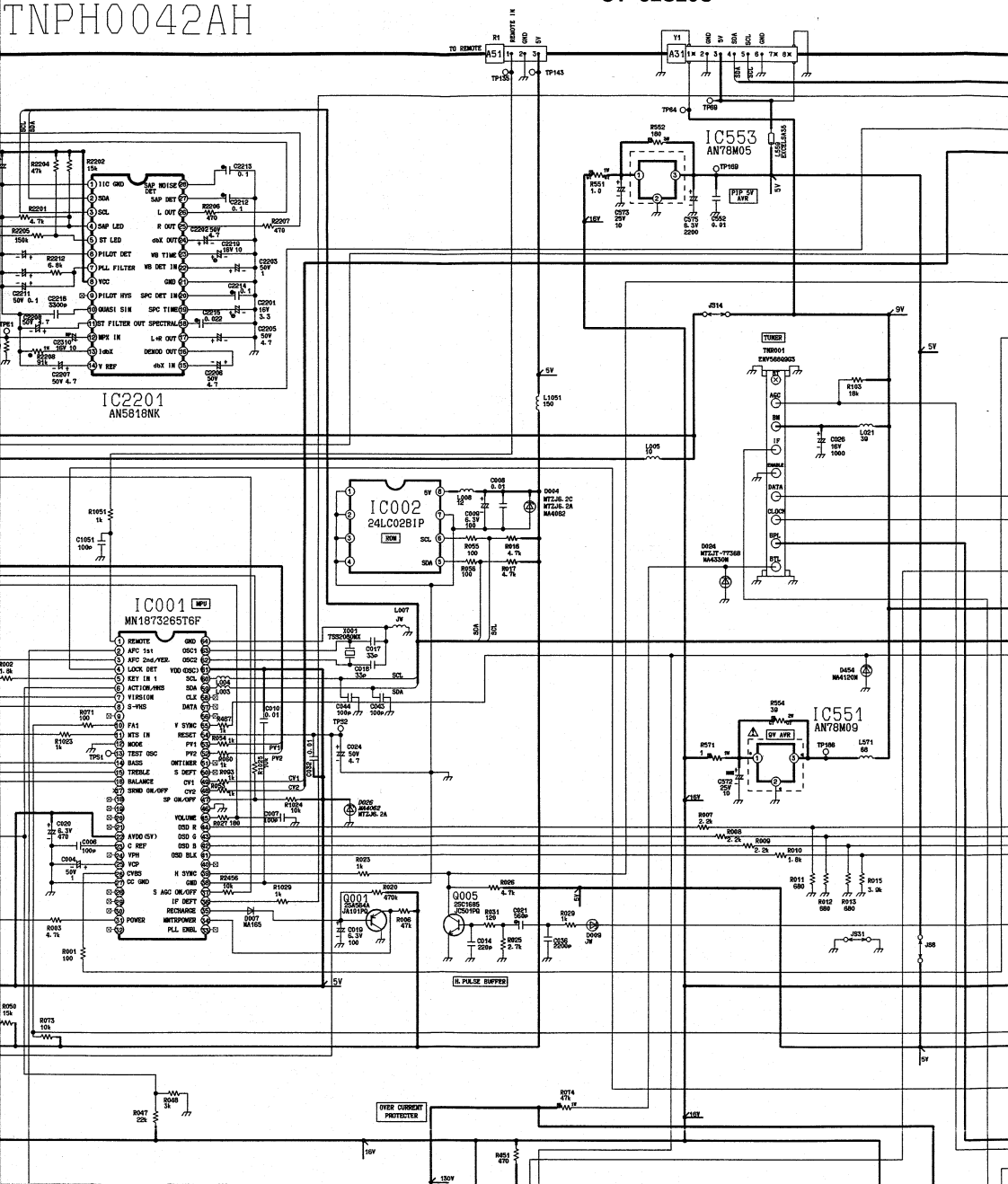
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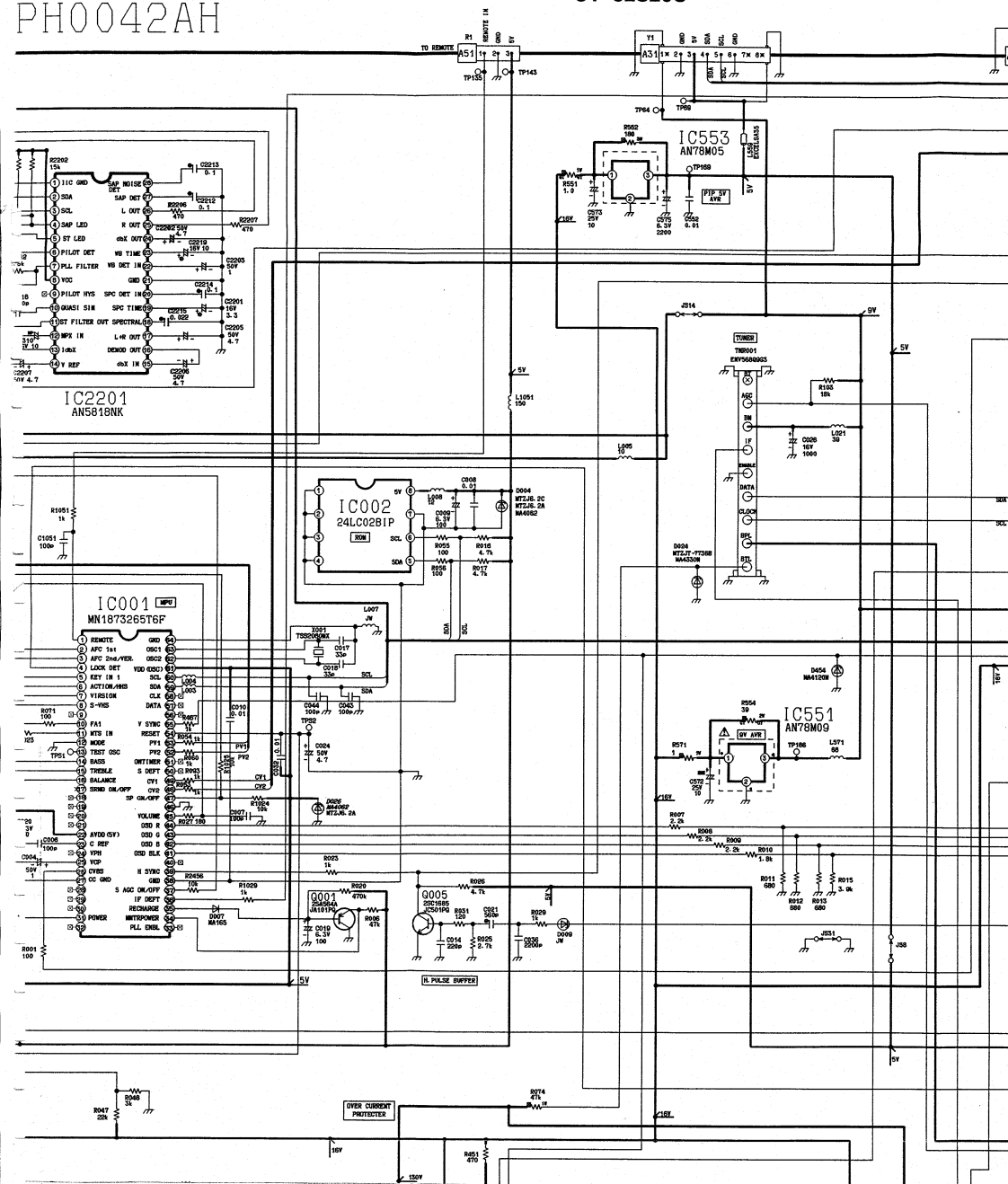
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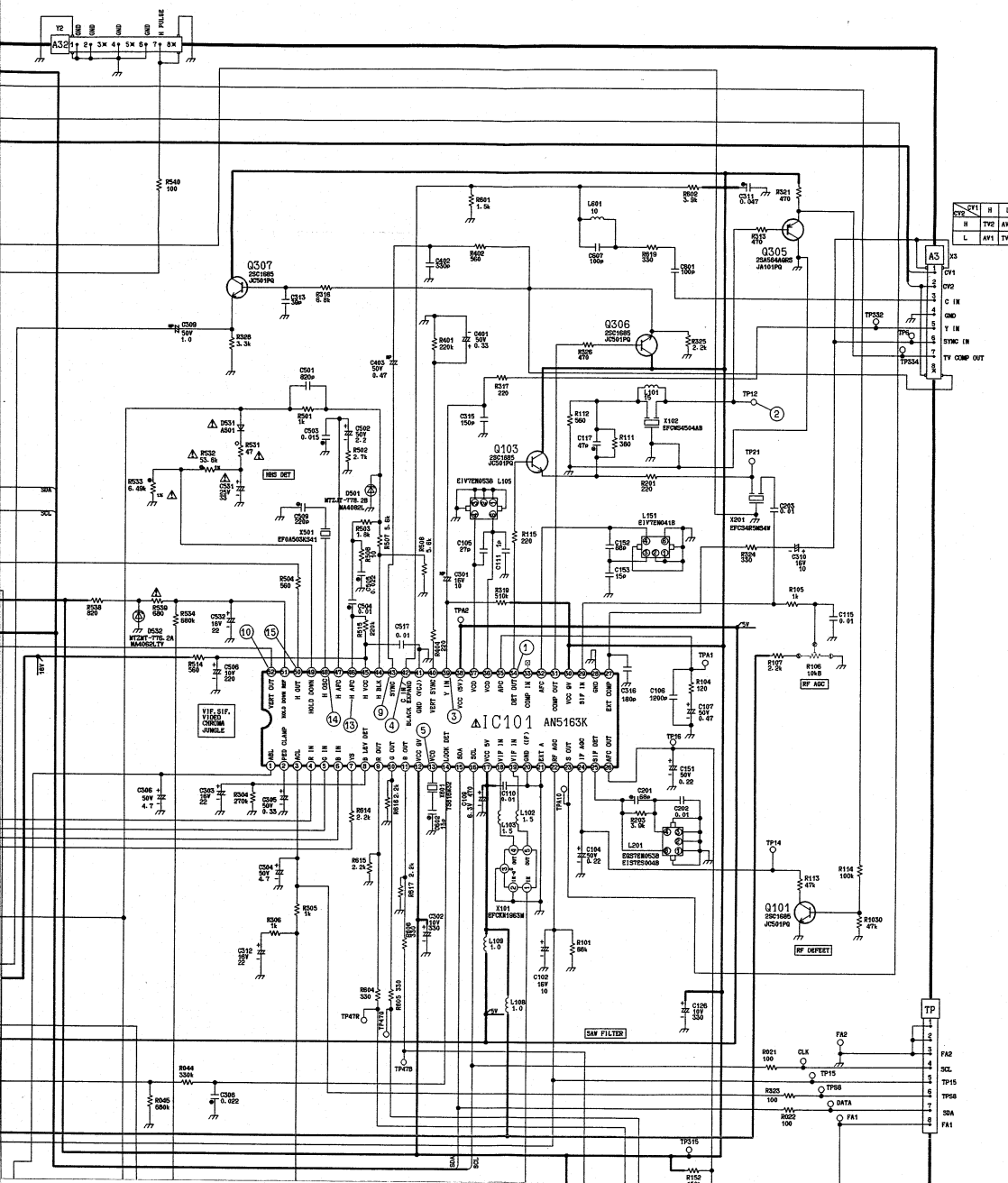


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H



2

3

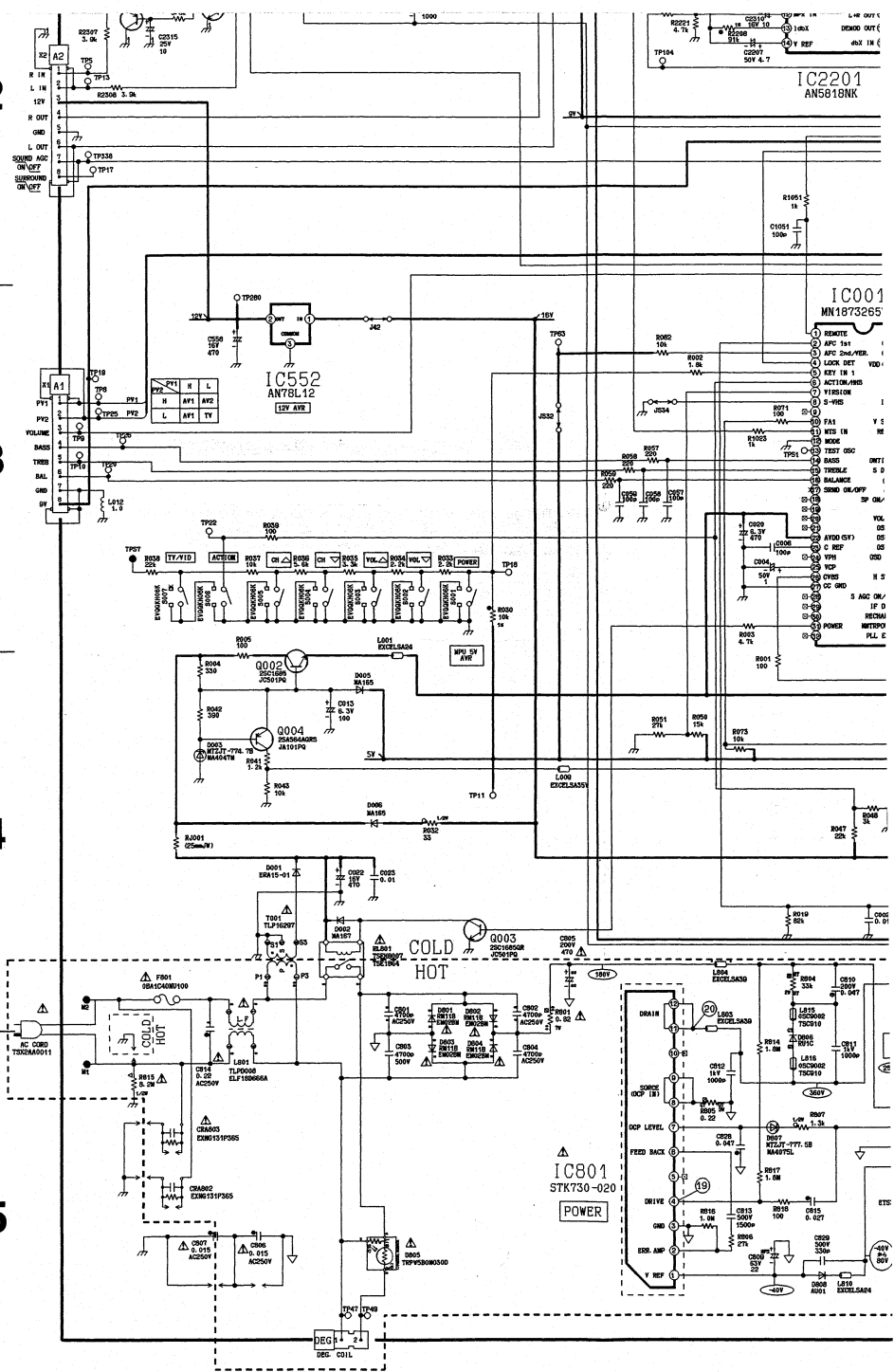
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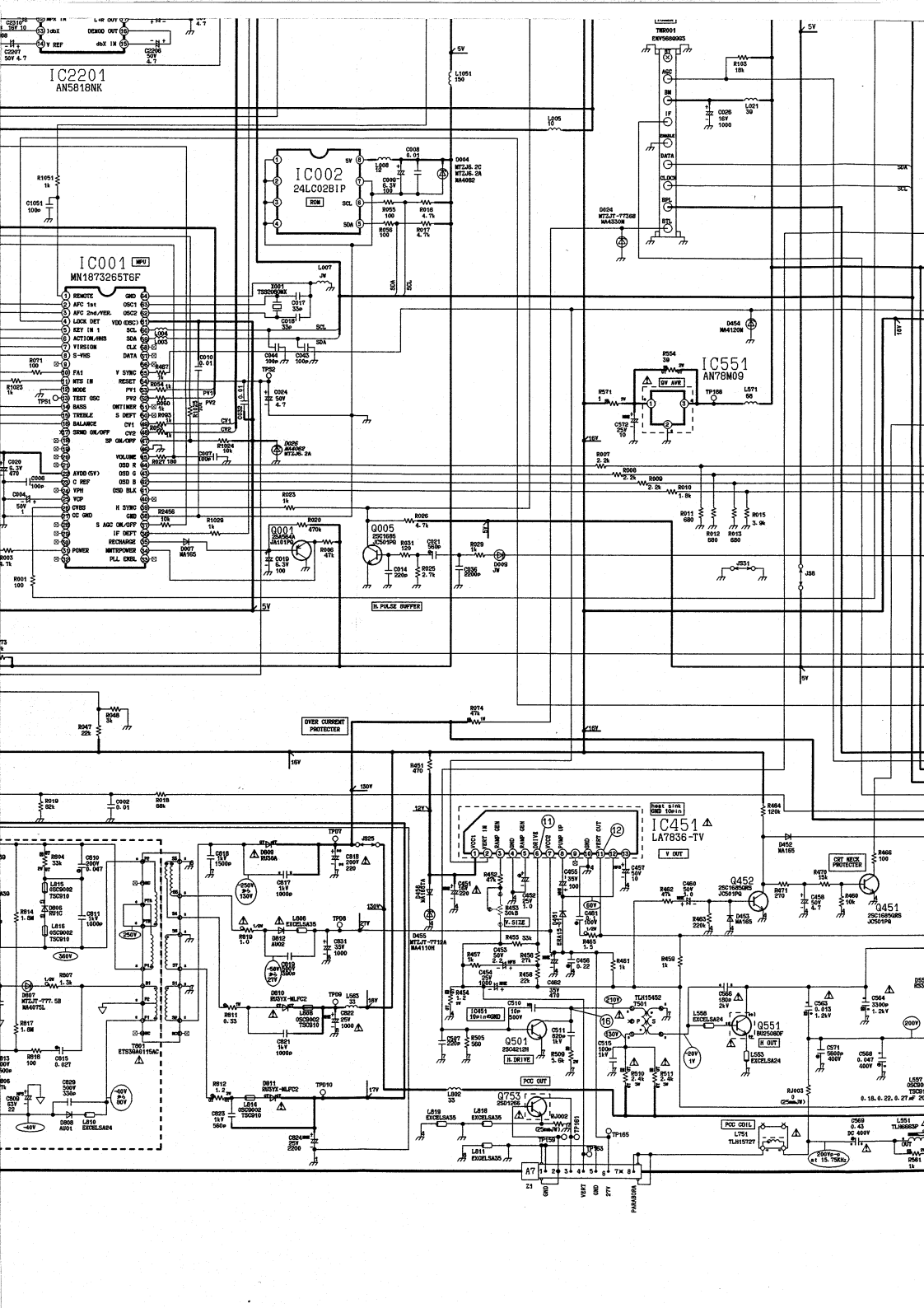
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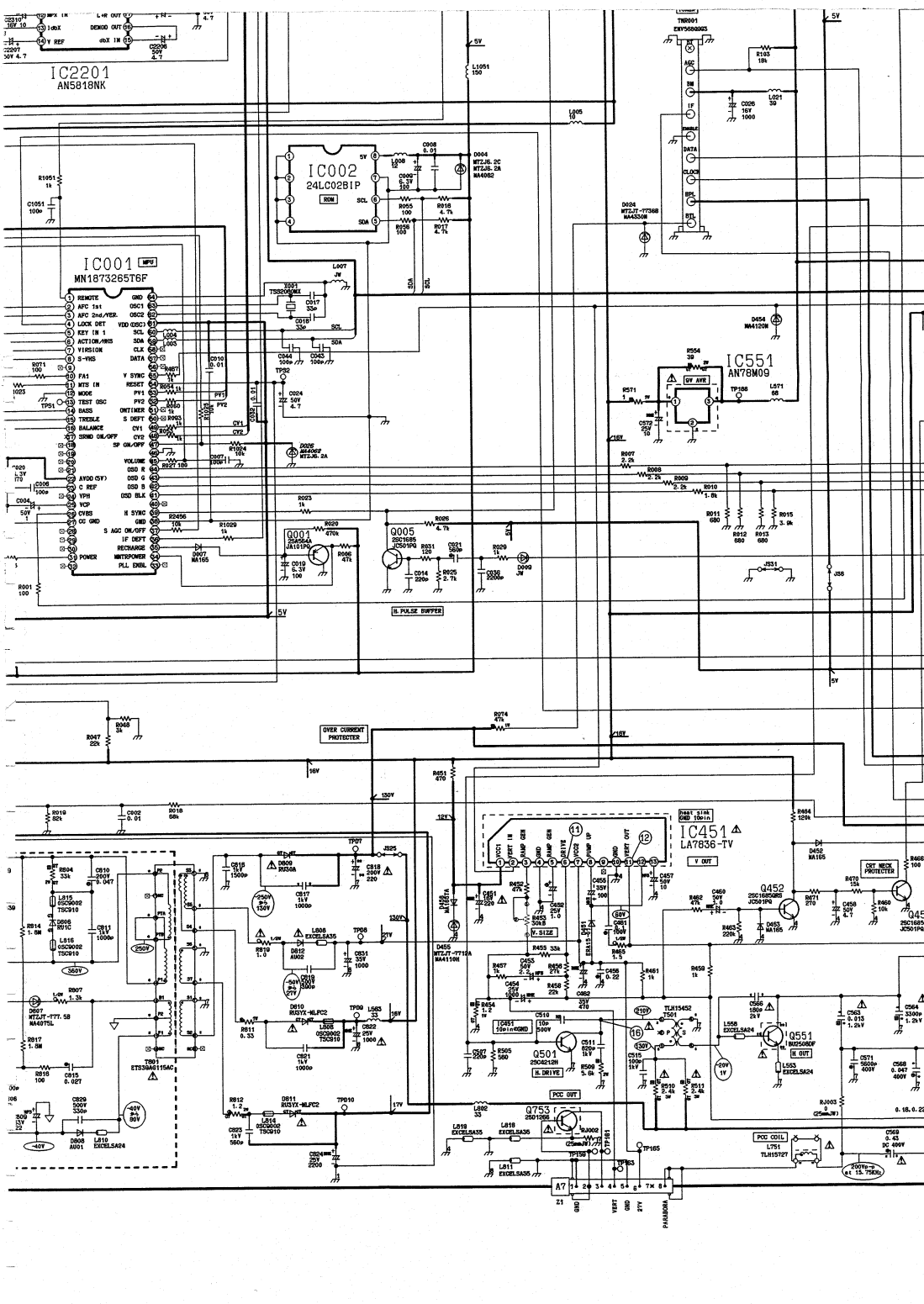
Sheet 2 of 4
Side A

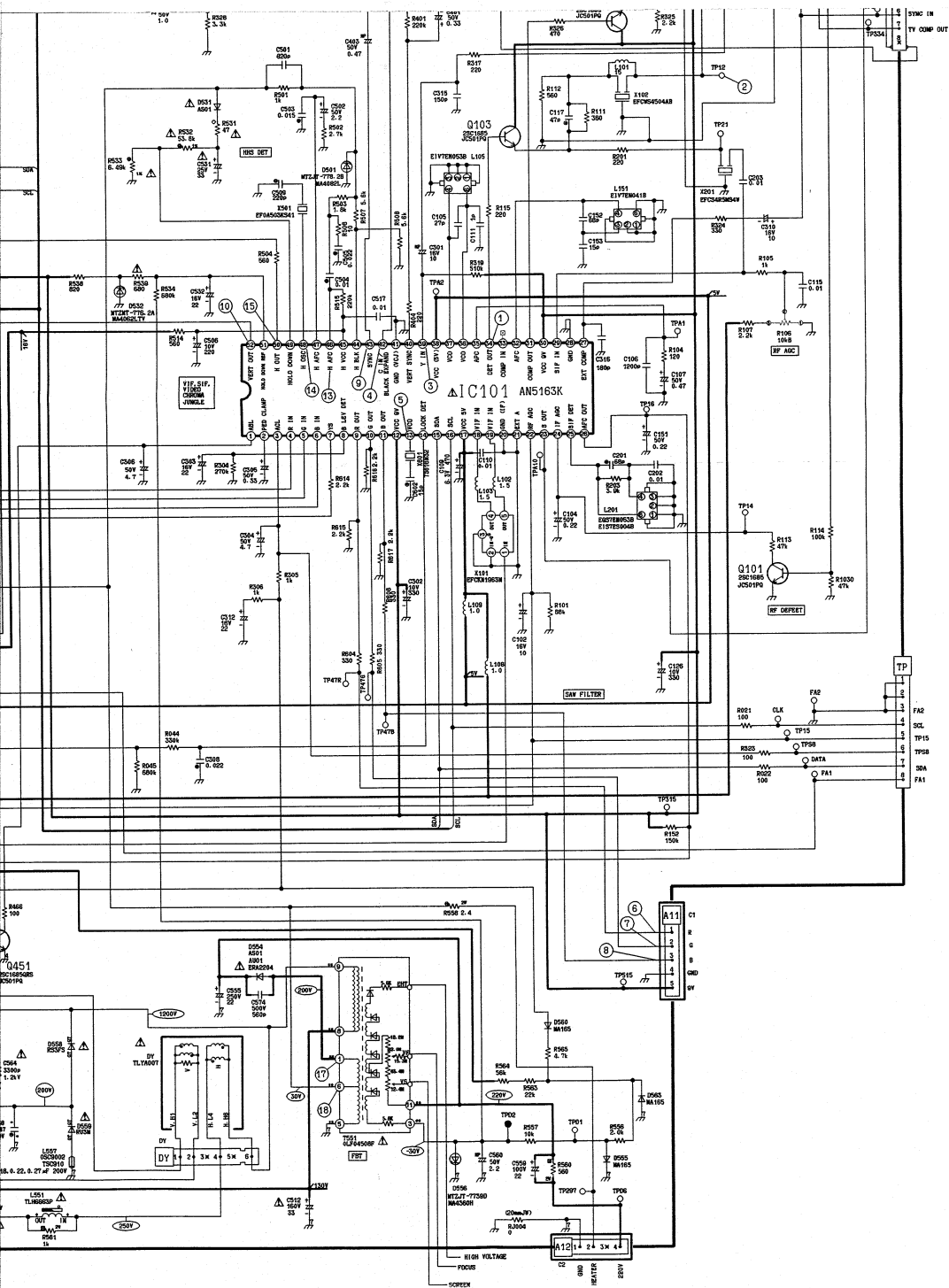
A-Board Schematic
CT-32S200



IMPORTANT SAFETY NOTICE
THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES THAT ARE IMPORTANT FOR PROTECTION FROM X-RADIATION, FIRE, AND ELECTRICAL SHOCK HAZARDS. WHEN SERVICING THIS SET, IT IS ESSENTIAL THAT ONLY MANUFACTURER'S SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS DESIGNATED WITH A Δ IN THE SCHEMATIC.

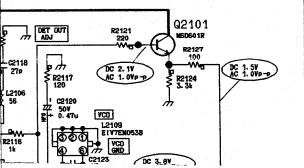






COMB FILTER



F

IMPORTANT SAFETY
THE SCHEMATIC DIAGRAM IN THIS MANUAL CONTAINS FEATURES THAT ARE IMPORTANT TO YOUR SAFETY WHEN SERVICING IT IS ESSENTIAL THAT YOU FOLLOW THE MANUFACTURER'S SPECIFIED SAFETY PROCEDURES FOR ALL CRITICAL COMPONENTS DESIGNATED BY THE SCHEMATIC.

E

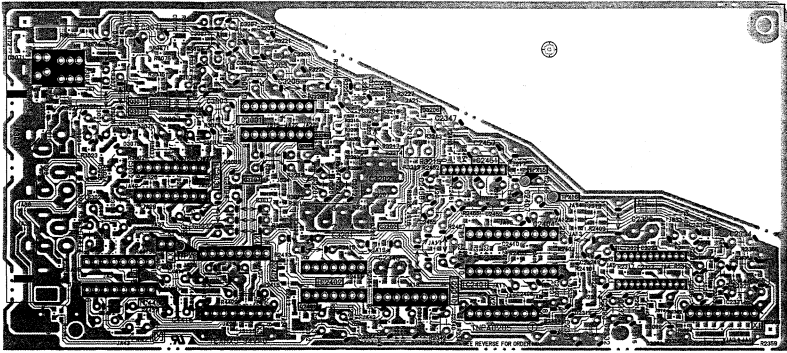
IMPORTANT
THIS SCHEMATIC IS
FEATURED THAT ARE
X-RADIATION, FIRE,
WHEN SERVICING
MANUFACTURERS SE
CRITICAL COMPONENT
SCHEMATIC.

F

G

H

X-Board TNPA0205 All Receivers



Voltage Measurements – "X"-Board

IC2302					
01	6.02	12	2.55		
02	0.00	13	6.05		
03	N.C.	14	6.05		
04	0.00	15	2.53		
05	6.19	16	0.32		
06	6.23	17	6.22		
07	2.86	18	6.19		
08	2.13	19	N.C.		
09	6.05	20	N.C.		
10	N.C.	21	11.98		
11	2.55	22	6.02		

IC2401					
01	11.90	11	0.00		
02	5.09	12	0.50		
03	4.94	13	1.46		
04	1.22	14	5.97		
05	5.95	15	5.97		
06	5.98	16	5.97		
07	5.97	17	5.97		
08	5.95	18	5.81		
09	5.95	19	0.00		
10	0.00	20	N.C.		

IC3001					
01	4.56				
02	0.00				
03	3.12				
04	0.00				
05	3.18				
06	3.13				
07	0.52				
08	4.55				
09	4.55				
10	0.00				
11	4.55				
12	0.00				
13	8.79				
14	4.56				
15	0.00				
16	4.56				

IC3031					
01	4.56				
02	0.85				
03	3.13				
04	0.00				
05	3.13				
06	3.13				
07	0.85				
08	4.56				
09	4.56				
10	0.00				
11	4.56				
12	0.85				
13	8.79				
14	4.56				
15	0.00				
16	4.56				

IC4402					
01	4.56				
02	0.87				
03	3.14				
04	0.00				
05	3.14				
06	3.13				
07	0.86				
08	4.56				
09	4.56				
10	0.00				
11	4.57				
12	0.87				
13	8.79				
14	4.57				
15	0.00				
16	4.56				

IC2402					
01	3.13				
02	4.55				
03	4.55				
04	4.56				
05	7.88				
06	7.88				
07	0.00				
08	4.28				
09	4.27				
10	4.28				
11	3.13				
12	0.01				
13	0.01				
14	8.79				

IC2451					
01	5.99				
02	1.47				
03	6.01				
04	11.98				
05	6.00				
06	0.00				
07	3.69				
08	6.06				
09	2.04				
10	5.99				

IC2340					
01	6.05				
02	6.05				
03	6.05				
04	0.00				
05	6.05				
06	6.05				
07	6.05				
08	10.16				

	Q2401	Q2402	Q3007	Q3071	Q3072	Q3073	Q3201	Q3202	Q3203
B	0.51	0.62	3.12	6.54	2.06	4.46	5.90	2.47	2.46
C	7.86	0.01	0.00	8.79	4.47	8.79	8.78	4.48	4.40
E	0.00	0.00	3.80	5.92	1.44	3.82	5.25	1.86	1.86

	Q3204	Q3205	Q3206
B	4.48	4.40	0.51
C	8.79	8.79	8.69
E	3.84	3.76	0.00

CHIP TRANSISTOR LEAD DESIGNATION



IMPORTANT SAFETY NOTICE
ESSENTIAL INFORMATION INCORPORATES SPECIAL PRECAUTIONS THAT ARE IMPORTANT FOR PROTECTION FROM RADIATION, FIRE, AND ELECTRICAL SHOCK HAZARDS. IT IS ESSENTIAL THAT ONLY FACTORIES SPECIFIED PARTS BE USED FOR THE CALCULATED AND VERIFIED WITH A QUALITY THE MARK.

MT09606655A1



IC2101			
01	N.C	13	3.63
02	N.C	14	3.61
03	N.C	15	3.54
04	3.77	16	5.00
05	2.52	17	2.86
06	2.65	18	2.62
07	2.65	19	2.58
08	0.00	20	5.01
09	2.65	21	2.59
10	1.21	22	N.C
11	N.C	23	2.52
12	4.64	24	N.C

	Q2101
B	2.85
C	5.01
E	2.36

**CHIP TRANSISTOR
LEAD DESIGNATION**

